NR 2004:13

The Significance of Organisation for Healthy Work

Methods, study design, analysing strategies and empirical results from the MOA-study

Annika Härenstam,[1,2] Anna Rydbeck,[3] Monica Karlkvist,[2] Kerstin Waldenström,[2] Per Wiklund[2] and the MOA Research Group

1. Department of Work and Health, National Institute for Working Life, Stockholm, Sweden
2. Division of Occupational Health, Department of Public Health Science, Karolinska Institutet, Stockholm, Sweden
3. Department of Social Science, University of Örebro, Sweden

ARBETE OCH HÄLSA | VETENSKAPLIG SKRIFTSERIE

ISBN 91-7045-729-8 ISSN 0346-7821

Arbetslivsinstitutet
National Institute for Working Life

Arbete och Hälsa

Arbete och Hälsa (Work and Health) is a scientific report series published by the National Institute for Working Life. The series presents research by the Institute's own researchers as well as by others, both within and outside of Sweden. The series publishes scientific original works, dissertations, criteria documents and literature surveys.

Arbete och Hälsa has a broad target-group and welcomes articles in different areas. The language is most often English, but also Swedish manuscripts are welcome.

Summaries in Swedish and English as well as the complete original text are available at www.arbetslivsinstitutet.se/ as from 1997.

ARBETE OCH HÄLSA
Editor-in-chief: Staffan Marklund
Co-editors: Marita Christmansson, Birgitta Meding, Bo Melin and Ewa Wigaeus Tornqvist

National Institute for Working Life
S-113 91 Stockholm
Sweden

ISBN 91–7045–729–8
ISSN 0346–7821
http://www.arbetslivsinstitutet.se/
Printed at Elanders Gotab, Stockholm

Contents

Introduction

With the present report, we intend to make a contribution to knowledge concerning the linkage between organisations and working conditions and health in contemporary working life. Empirical evidence and experience from data collection in one specific study (the MOA-study[1]) are presented and used as illustrations of methodological issues that need to be dealt with.

In the first section of the present report, the design, the sampling strategy, assessment methods and analysing strategies in the MOA-study are described. In the following sections, empirical results of analyses linking organisational data with individual data on working conditions are presented, including descriptions of the methods used. First, we present the identification of relevant organisational aspects and statistical tests of the relevance of specific organisational dimensions linked with working conditions. Empirical results of pattern and multilevel analyses of organisational characteristics are described in the next section. Thirdly, empirical results on organisational changes are presented. Finally, conclusions from the empirical results, experiences from the data collection and analyses are drawn and research questions of interest for future research are raised.

The methods and experiences from the MOA-study have been further developed within a research programme with the objective of theoretically and empirically exploring how organisational conditions, work place characteristics and individual conditions affect working conditions, work related health and ill health.[2]

Background

Having a greater knowledge of the organisational context in which work is performed would be beneficial for both the practice and the development of theory. The transfer of knowledge on risk factors from traditional occupational health research into action in organisations requires insight into the organisational context that shapes the working conditions at the task or individual level (Burstyn & Teschke, 1999; Hagberg et al, 2001). Otherwise, it is possible that actions to prevent job-related ill health or to promote healthy and developing work will not achieve their goals or might even result in counterproductive intervention strategies. Political, scientific, and inter-party groups have recommended systems at the structural level for implementing preventive measures in the work environment (Frick et al, 2000; ILO, 2001; Levi et al, 2000). In organisation research, there is a growing interest in social structural approaches to organisational analysis. Lounsbury and Ventresca (2003) conclude that the main stream of organisation research has been disconnected from the issue of societal stratification and social change. Instead, such issues have been studied in other disciplines from a macro-perspec-

[1] The full name of the study is "Modern work and living conditions for women and men. Development of methods for epidemiological studies" (FAS, grant no: 95-0331).

[2] Changing organisations and work-related health, FAS, grant nr, 2001-2890.

tive, excluding organisation as the mediator between societal changes and the individual's work and living conditions and health, at least in empirical studies. It has been maintained that there is a gap between work and health research and its management-oriented organisational counterpart that needs to be bridged by studies that apply knowledge from both arenas, since both organisational conditions and job-specific factors form a person's total work environment (Bliese & Jex, 2002; Kalleberg, 1994; NORA, 2002; Thompson & McHugh, 2002). This could be accomplished by linking data on organisations to data on working conditions and health.

Theories and models on organisations and working conditions at the individual level are mainly from the 1970's or earlier (Blauner, 1964; Emery & Thorsrud, 1969; Gardell, 1977; Hackman & Oldham, 1976; Herzberg, 1966; Karasek, 1979; Katz & Kahn, 1978; Kornhauser, 1965; Lazarus, 1966; Lysgaard, 1961; Trist, 1978; Volpert, 1974). The organisational and working conditions studied in these models were based on empirical studies of a traditional industrial labour market (Sennett, 1998 p. 16). This means, for example, fixed boundaries to work in time and space, strict division of manual and non-manual work, and highly regulated employer-employee relations. Also, it was usually assumed that workers spent a long time within the same organisation. In these times when working life is described as volatile and flexible, science has a particular responsibility, not only to scrutinise these trends but also to ground theoretical concepts on empirical studies. We need to know the extent, the range and the variety of certain phenomena, and we also need to know more about the linkages between organisational phenomena and conditions for the employees in contemporary working life. This means that organisational phenomena should be explored in comparative studies with large samples of organisations and individuals.

Our perspective originates from studies of working conditions and health with the intention of studying variations between groups of individuals in ways that can be linked to organisational conditions. Consequently, our theoretical understanding is based on causal mechanisms and structuralism rather than constructivism. We are interested in differences and regularities in the sense of studying a broad range of organisations and working conditions rather than any specific kind of organisation or occupation. The aim is thus to find empirically based general knowledge about the relationship between the organisation and the individual as well as to improve the quality of working life.

First, we need to know *what aspects* at the organisational level are important for the understanding and, secondly, *how* such organisational aspects can be *assessed*. Thirdly, we need to know *what level*[3] in organisations are relevant when studying relations connected to working conditions and health. Finally, the *mechanisms* that link organisational dimensions with working conditions and health of the workers need to be established.

The theoretical background and earlier empirical research including methodological challenges are presented in a forthcoming report (Härenstam et al, manu-

[3] Such as task level, group level, department, work site, company, corporation.

script). That report also includes a description of another study (the Healthy Work Place Study) that applies many of the methods developed in the MOA-study and a structured interview method for assessment of organisational characteristics is introduced.

Aim

The aim with the present report is to explore the significance of organisational aspects for working conditions and to develop assessment and analysing methods, suitable for such studies.

The report contributes to the development of theory and methodology with knowledge about *what* organisational aspects should be assessed and *how* they can be *defined, operationalised, and analysed* in relation to data on working conditions. This means that the linkage between working conditions and *health* is not explored. Instead, aspects of working conditions that earlier research had shown to be important for health were chosen as "outcomes" in relation to organisational aspects. The design, the sampling strategy, assessment methods and analysing strategies in the MOA-study[4] are described. Empirical results on the relevance of organisational dimensions as well as on analyses linking organisational conditions with working conditions are presented.

Specific issues addressed are as follows:

1. What organisational aspects should be studied?
2. How can relevant organisational aspects be defined, operationalised, and assessed?
3. How can the linkage between organisations and individuals be analysed?
4. What is the impact of conditions at the organisational level on working conditions?
5. Do associations between organisational characteristics and working conditions differ between categories of the work force?[5]
6. Identification of important questions for further empirical investigation and theoretical and conceptual development.

---

[4] The overall aim of the MOA-study was to: (1) develop methods for the assessment of organisational, working and living conditions; (2) develop analytic strategies for epidemiological studies and health surveys; in order to (3) identify social settings and working environments associated with different risks of ill health in contemporary working life; and to (4) facilitate efforts in preventive health work by providing a foundation of knowledge on relevant contextual factors beyond individual-related factors. The abbreviation MOA stands for Modern Work and Living Conditions for Women and Men. The research sets out to obtain knowledge of current working and living conditions for women and men in different life situations, and how these conditions link with the labour market and organisational context. This aim includes the development of an analysing strategy and the examination of methods for identifying hazardous and supportive work environments. Other research questions than organizational ones, are reported elsewhere: on methods for assessment of working conditions (Ahlberg et al, 1999; Leijon et al, 2002; Waldenström et al, 2003); identification of living and working conditions with different risks for ill-health (Härenstam et al, 2003; Karlqvist et al, 2003); qualitative analyses of the significance of work-related factors from the individual's point of view (Allvin et al, 1999; Wiklund & Härenstam, 1995; Härenstam et al, 1999a).

[5] Such as women and men, groups with different educational levels and age.

Study design and analysing strategies

The data was collected between 1994 and late 1997. Several perspectives and methodological approaches characterised the study design and research process.

Perspectives

- A *comprehensive perspective* on people's work and life situations. Conditions in both paid employment and private life were investigated.
- In order to detect early indications of work-life changes, exposing some groups to greater risks of ill health than others, *contextual* data such as labour market and organisational phenomena were included.
- The research object consisted of organisational, social, psychological and physical workload and chemical/physical conditions in working life, and also several conditions in the private sphere. The findings are therefore based on a *holistic and multidisciplinary approach.*
- The *gender perspective* was central. One of the objectives of the study was to choose areas of investigation reflecting conditions inside and outside paid employment that applied equally well to women and men. Secondly, the gender-segregated nature of the labour market meant that structural factors needed to be integrated.

Methods

- The study used *two methodological perspectives*. The *external perspective* meant that the researchers established the assessments and their criteria. Most often, the assessments and criteria were based on observational or measurement data. The *internal perspective* was based on the personal judgements and evaluations of the individuals under study.
- A *mixed method approach* (Creswell, 2003) was applied. Quantitative and qualitative methods were combined in two ways: qualitative assessment methods, such as interviews and observations, were analysed, categorised and later used in quantitative analyses. Furthermore, qualitative methods were used in parallel with quantitative methods; the data were analysed separately and the results were compared. The latter strategy is supposed to increase the interpretability and validity of the results (Creswell, 2003, p. 221). In some cases, particularly when testing the reliability and validity of commonly used questionnaire items, three different methods (questionnaires, interviews and observations or technical measurements) were used in parallel, the so called triangulation technique (Denzin 1978).
- The variables selected needed to be reliable and valid for both women and men.

Analysing strategies

Statistical analyses

We used four analysing strategies for the investigation of the links between organisational aspects and working conditions. The main strategy was to apply multivariate *pattern analyses*. As a starting-point, we assumed that separate dimensions of organisational aspects do not separately influence the working conditions. Complex patterns and interactions between several organisational characteristics were instead suggested to have an impact. For the identification of categories of organisations, constituted by many different aspects, cluster analysis was chosen as the most appropriate method. Later on, such clusters of organisations were used in multi-level analyses for the investigation of associations with working conditions. Thus, *multi-level analysis* was the second analysing strategy applied. Some results of such analysis are summarised here and presented in more detail elsewhere (Härenstam et al, 2000c; 2004).

The third approach was *variable-oriented*. We have performed comparative analyses of organisations by applying existing classifications of establishments. These classifications were for example, type of operations (Giertz, 2000), ownership and position vis-à-vis other companies, (for example core companies and contractors). These classifications pointed to differences in how work is organised and in working conditions. The results are presented elsewhere (Härenstam et al, 2000a; 2000b; Härenstam and the MOA Research Group, 2005).

Variable-oriented analyses were also used as a supplement to the pattern-oriented analyses and multi-level analyses in order to identify the most relevant dimensions of organisational characteristics in relation to working conditions at the individual level.

Qualitative analyses

The fourth approach involved the use of *qualitative methods* for data collection and analysis. Open-ended interviews with the study-group individuals were performed aimed at identifying important aspects of working life that were, from the individual's own point of view, regarded as important for their own working conditions and well being. Structured interviews with managers on organisational characteristics were performed. This information was analysed, classified, and used in quantitative analyses.

Sample and procedure

The sampling procedure was motivated by the explorative approach of the study. This means that we aimed at a sample that was similar to a broad, representative sample of organisations and the labour force in Sweden. Data from the two levels was collected from different sources; key informants such as managers on organisational aspects and from the employees themselves at the individual level. Traditional work sites were included as well as those where new forms of organisation and production were in place. These were strategically selected. The main prin-

ciple for the strategic selection of work sites was to comprise a broad range and an optimal coverage of branches and working conditions in both the public and private sectors. The second principle was to achieve a distribution of important characteristics of the employees (class, sex, ethnicity, age, family situation, job contract type, qualification level and type of work), similar to representative samples of the Swedish work force at the time. The third principle was to achieve a gender matched sample that included subgroups of women and men at different qualification levels and types of work, large enough to permit gender-comparative statistical analyses.

The selection was guided by current statistics and research reports on labor market and labor force characteristics as well as new classifications of branches and types of work sites (Giertz, 2000; Giertz & Larsson, 2000). Furthermore, a matrix on data of all occupations in Sweden from large representative databases was constructed. Statistical methods such as cluster and discriminant analyses were employed to identify clusters of occupations with small within-group differences (Bodin et al, 1997). The results were used for choosing criteria as well as for evaluating the sample. Finally, the results of descriptive analyses of commonly used questionnaire items on working conditions were compared to results from surveys on large, randomly selected samples, using the same assessment methods.

As a first step, occupational groups or trades were selected in order to attain large variation. Specific work sites where these groups could be found were selected in several different ways, for example, through information from branch organisations or by using a telephone directory. Contact was initiated by telephone and written information was sent to the managers and other key persons at the work site. Based on the four criteria defined in advance, 81 work sites in public (36%) and private (64%) enterprises in five counties in Sweden were selected (see figure 1).

The definition of a work site applied was “a physical unit with one address, one employer and a budget of its own”. The informants at the organisational level were supposed to have employers’ responsibilities. In some cases, this operationalisation was problematic. One of the multinational companies in the study had several divisions with their own directors and a separate budget even though they shared the same address. Three of the divisions participated as separate work sites. Other problematic examples were construction and transportation companies in which work was performed at different places.

From a total of some 8,000 employees at the selected workplaces, 220 male and female employees at each place were picked out in the final step of the sampling procedure. The main criterion for the selection of individuals was that they were “typical” representatives for the staff at each workplace, respectively, besides having an occupation that was picked out in the first step of the successive selection process. Information about the staff structure, collected at the interview on organisational characteristics was used as a basis for this final step of the selection.

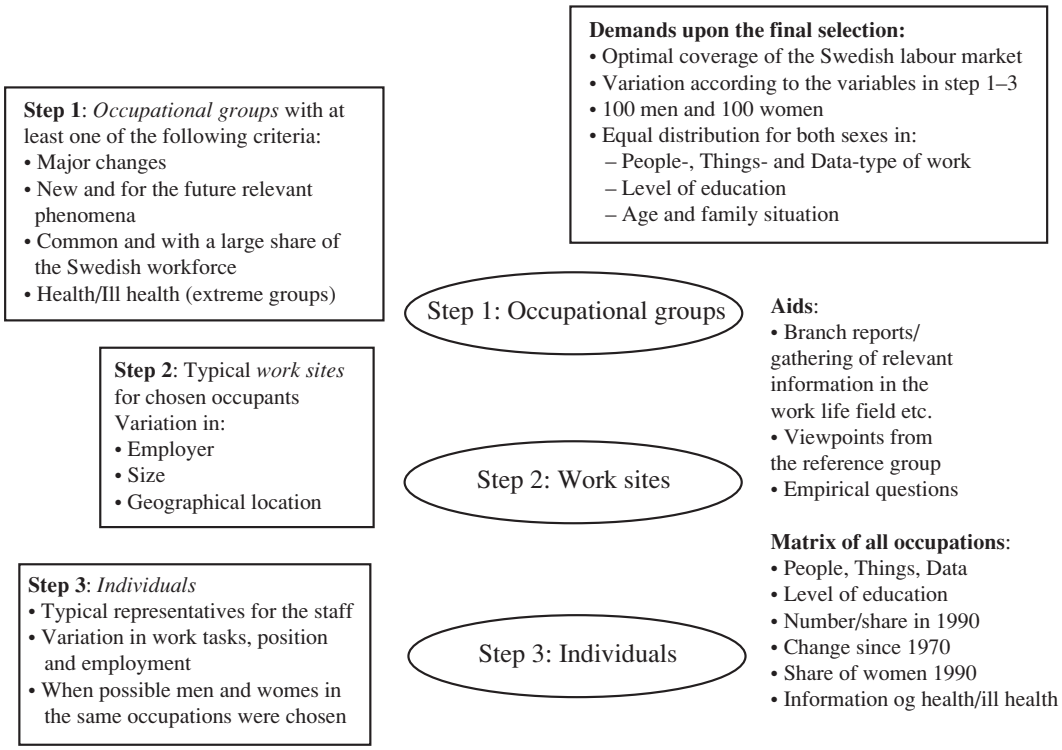

Figure 1. The successive selection process in the MOA-study

Drop-out

From the work sites selected first, 29 percent did not agree to participate. These work sites were however replaced by others, similar to the first. This was possible as a successive selection procedure was applied. Therefore, the final sample of work sites comprised all types of branches and trades that were decided upon in advance. Most of the enterprises that did not want to participate were small. According to the managers, the main reason was lack of time or that the employees did not want to participate. The other reasons were that the workplace was in the middle of reorganisation or that the tough competitive market-situation did not permit time for anything extra. The dropout number of individuals at the selected work sites was only one person. He was self-employed and did not turn up to the appointed meetings for data-collection at several occasions, which is why we had to exclude him. We did not get in contact with him again to get an explanation for why he chose to leave the project after the initial contact when he accepted to participate.

Description of the selected work sites

Location. The work sites were located in five counties in the middle of Sweden from Värmland in the west to the Stockholm archipelago in the east. However, there was a dominance of work sites located in the Stockholm and Örebro area. Work sites located in cities as well as in towns, suburban areas, small municipalities and countryside, were all represented.

Size. The work sites differed in size from 700 employees to none. Of the total number of 81 workplaces, only nine consisted of the self-employed. Of the remaining 72 work sites, ten had less than 10 employees, 48 had more than 10 but less than 150 employees and 14 had more than 150 employees. In the present report, descriptions of data at the organisational level, refers to the 72 work sites that had at least one employee.

Ownership. The work sites differed with regard to ownership. 57 had private owners, (varying from small enterprisers to large national and multinational companies, and cooperative owners), 24 work sites were publicly owned (five companies and 19 administrations with municipality, county or the government as owner).

Gender composition. At the choice of work sites, the gender composition was taken into account. The gender distribution was considered as male-dominated when at least 70 percent of the staff was males and as female-dominated when at least 70 percent was females. The rest were defined as gender-mixed. In the final sample, 24 percent of the work sites had female-dominated staff and 31 percent had male-dominated.

Type of operation. A classification system of types of operations developed by Eric Giertz (2000) was applied. This system aims at categorising work places regarding both organisation, type of production, management, demands of competence and technology, and market situation. In the present study, some of the 21 categories in Giertz' system for classification were merged in order to be large enough for comparative analyses.

The aim in the sampling of work sites in the MOA-study was a similar distribution of types of operations as in Sweden 1996.[6] In this, we succeeded rather well (figure 2 and 3).

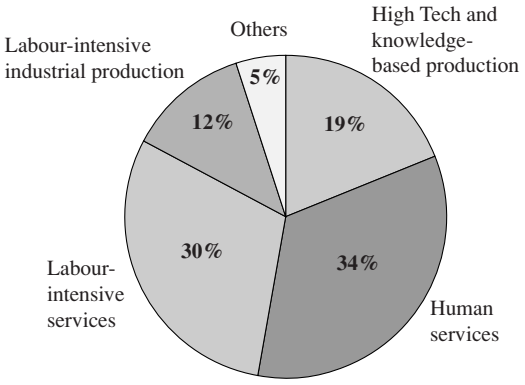

Figure 2. Distribution of the Swedish labour force in terms of different trades 1996 according to a modification of the classification system constructed by Giertz, 2000.

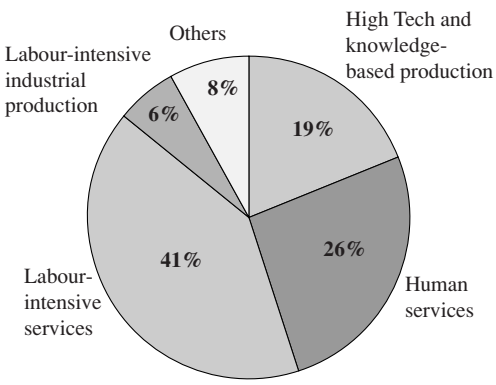

Figure 3. Distribution of employees in the MOA study.

[6] See Härenstam et al, 1999:12.

Description of participating individuals

The selected sample covered 85 occupational titles of approximately 1/3 working with "*people*", "*things*" and "*data*", respectively (according to a modified classification system developed by Kohn and Schooler (1983). Seventy-five percent of the sample was matched pair wise (woman-man) by type of work, and qualification level of occupation. Whenever possible, the matched pairs were chosen at the same work sites. The remainder were selected within gender-segregated work sites and occupations. The choice of individuals was made successively in order to achieve the criteria, decided in advance, such as an equal number of women and men, and a fairly equal distribution between men and women regarding age, socio-economic groups, family situation and work object (people, things and data). In view of the exploratory objective, the study group is characterised by variation rather than representativeness. The group comprised 111 women and 110 men, in long-term and temporary employment, and of varying positions, occupations, ages and educational levels. The self-employed were excluded in most of the analyses presented here, as they were the source of data at both the individual and organisational levels. This means that 104 women and 104 men were included in most of the analyses presented here. Demographic data are presented in Table 1.

Evaluation of the sample

Comparisons of the MOA-sample and representative samples of the Swedish work sites and occupations were performed. This evaluation showed that the distribution of sectors, branches and types of work sites is similar to that throughout Sweden during the same time period. As the labour-intensive service sector comprises many small work sites and a broad range of branches and occupations (such as transport, trade, construction, repair workshops, cleaning, office work, banking, etc.) this sector is over-represented in the MOA-sample. Correspondingly, the human service and industrial sectors, which comprise many large work sites, are underrepresented in terms of the number of individuals. Furthermore, occupations from all clusters of occupations, (constructed as a support for the sampling as described earlier), are represented in the MOA-study group. However, individuals with occupations in the largest clusters of occupations are underrepresented and smaller clusters are over-represented.

The MOA-sample deviates from a nationally representative sample primarily regarding the distribution of women and men in the selected occupations. Gender-mixed occupations for women and men, men in female-dominated and women in male-dominated occupations are over-represented (10-20% difference in each group). However, men and women in the whole study group are equally distributed regarding family situation, ethnicity and qualification level and similarly distributed regarding age and education level.

Table 1. Description of the study group, n=208, percentages.

	The MOA study group			Swedish labour force, 1995		
	Women	Men	Tot	Women	Men	Tot
Number of subjects	104	104	208	1948584	2111014	4059598
Educational level[a]						
low level	40	41	41	59	56	57
medium level	34	39	34	29	31	30
high level	26	20	26	12	13	13
Type of work[b]						
working with people	39	34	36	53	21	36
working with data	34	24	29	29	31	30
working with things	28	42	35	18	49	34
Qualification level of occupation[c]						
low level	41	39	40	38	28	33
medium level	39	39	39	49	55	52
high level	20	22	23	12	18	15
Socio-economic group[d]						
manual workers	44	55	49	41	42	42
non-manual workers	56	45	51	54	44	49
Full-time work	76	91	84	58	91	75
Gender-segregation in occupation						
<30% women	23	44	34	11	68	41
>70% women	45	20	33	66	10	37
Type of trade[e]				n.a.	n.a.	
Knowledge & high-tech intensive			16			19
Human services			27			34
Labour-intensive services			47			30
Labour-intensive ind. production			9			12
Age group						
16-29 years	28	23	26	22	22	22
30-44	43	45	44	37	38	38
45-64	29	32	30	41	40	40
Foreign background[f]	12	12	12	11	11	11
Living with a partner	73	70	72	75	72	73
Children < 12 years at home	34	33	33	n.a.	n.a.	n.a.

[a] Years of education added to 9 years of compulsory school. Low =less than 2.5 years, medium =between 2.5 and 5.5 years, and high =more than 5.5 years.
[b] A modified version of a classification system developed by Kohn and Schooler (1983).
[c] Socio-economic group (according to SEI, based upon Nordic occupational code, 5-digit level), and educational level required in occupation. Low =< 2 years, medium => 2 years for blue-collar worker, and > 2 but < 6 years for white-collar worker, high =6 years or more for white-collar worker, added to 9 years of compulsory school.
[d] Self-employed are excluded the MOA-study.
[e] Proportion of employed in work sites classified by large "branches" (modified classification after Giertz 2000).
[f] Born in a non-Nordic country, or born in a Nordic country with both parents born elsewhere.

The evaluation of the final sample of individuals showed that the MOA-study group is similar to a representative sample according to most important aspects of demographic and background data. However, the MOA-study group is somewhat younger and women more often work full-time in comparison with the Swedish work force in general. Furthermore, in spite of similarity to a nationally representative sample regarding qualification level in occupation, less educated women are under-represented and highly educated women are somewhat over-represented. Evaluations of the final sample with regard to self-reported working conditions show that there is a striking similarity in the distribution of responses in our study group for most of the questionnaire items on working conditions that could be compared with other large Swedish data sources (Härenstam et al, 1999c).

Data collection and assessment methods

Data collection started with structured interviews with managers at the work sites, followed by collection of data at the individual level from the selected employees. The first step was open-ended interviews where the selected individuals were asked to describe what they thought was significant to them in their working life and also in their total life situation. The results are published elsewhere and only summarised in the present report (Härenstam et al, 1999a). The data collection continued with questionnaires, expert assessments, participant observations, field measurements, and structured interviews. Thus, both quantitative and qualitative methods were employed. Full data collection lasted for about two months in the case of each individual case. Data collection concluded with a survey of organisational conditions and how these had changed. In total, the material consists of more than 1,000 hours of audiotaped interviews with respondents, 150 hours of interviews with managers and industry representatives, the findings of four major surveys (each with several hundred items), participant-observation data at selected workplaces (between four and six days per person), and workplace-based measurements of physical performance. Results of analyses of individual level data on working and living conditions have been presented elsewhere (Härenstam et al, 1999a; 1999b; 1999c; 2000a).

Methods and procedure for data collection on organisations

Procedure

Characteristics of the eighty-one private and public work sites encompassed by the study were assessed by five behavioural and social scientists from the MOA Research Group on the basis of interviews with managers and written material about the organisations.

At the participating work sites, somewhat more than 100 interviews with managers and other key persons were performed altogether. The interviews lasted for 30 to 90 minutes. Several interviews on the telephone were also performed and documents were requested and analysed in order to supplement the information

needed on all of the workplaces. The interviews were loosely structured and aimed at descriptive, objective information and covered several areas (see Table 2). Selection of dimensions was inspired by previous works (Le Grand et al, 1993; Bejerot et al, 1998b; Härenstam & Bejerot, 1995), summarised in a forthcoming report (Härenstam et al, manuscript), but was also shaped by what happened to come up in the interviews (i.e. by the empirical material).

Table 2. Areas examined in the interviews with managers at the workplaces.

Workplace and environment	Ownership, operations, market, competition, future prospects, customers
Formal structure of the workplace	Power structure, hierarchy, degree of formalisation
Production process and organisation of work	Work division/integration, group organisation, technical level/IT, disposition of operations in time and space
Workplace personnel	Workforce structure with regard to gender, ethnicity and age, skills, staffing and form of employment
Control system	Remuneration setting, incentive system, result measurement, management style, opportunities for development and training
Work environment	Sickness absenteeism, work injuries, occupational-health services, work-environment problems, internal control, rehabilitation routines
Social relations	Communications, work-related social contacts, corporate culture, relations between trade union, management and employees
Changes during the last two years	To personnel size and structure, production process, control system, work division/integration, skills requirements, hierarchical structure, power structure

Methods

The following descriptions encompass data regarding organisational characteristics as they were assessed at the time of the data collection, as well as data on organisational changes in the two-year period after the data collection, described retrospectively by the informant, i.e. the employer at each work site.

On the basis of these interviews, organisation descriptions were compiled – one for each workplace. Qualitative analysis of data in this first step was performed at a content level in order to define *what* organisational aspects were important and if they could be applied to all organisations. We intended to gather as objective information as possible, avoiding personal evaluations of these aspects from the informants.

A total of 79 items were defined, and variable values were generally allocated into three categories – low, medium and high, or reduced, unchanged, and increased (see appendix 1). When possible, criteria were formulated for each category. However, in some aspects, and this was the case for all aspects of organisational changes, the classification was performed as relative to the total sample. We were able to do this since there was large variation in the sample of work sites regarding all aspects studied. Definitions of the various categories were stipulated

within the research team by means of assessments and ratings (many of which were made independently of each other). Rating discrepancies were discussed till consensus within the research team was achieved.

After all data collection had been completed, re-categorisation of the initially assessed organisation descriptions was performed in order to test that the criteria had not changed over time. Finally, the number of variables was reduced via an indexing procedure. The means, the medians and ranges of the variables and 25 indexes (covering 42 different variables) are presented in appendix 2. The indexes are classified into five groups: structures, change strategies, management technologies, production processes and, finally, indexes assessing contextual factors. Indexes on organisational dimensions are labelled X and variables v in tables and appendices.

Some variables had missing data and concerned mainly small workplaces where there was no point in trying to assess all aspects. In some cases, we also experienced some difficulties in getting the information needed, for example, regarding the proportion of the staff who were members of a union.

Methods for data collection at the individual level

Working conditions, in aspects that earlier research has shown to be important for health, were assessed by both the individuals studied and by the researchers for application in the quantitative analyses. Thus, data can be regarded as having been collected from two methodological perspectives: the "internal", i.e. what is in the individual's mind; and the "external", i.e. what can be observed and measured on the basis of a single frame of reference for all study persons, regardless of occupation (Härenstam et al, 2003). Accordingly, the analyses are based not only on employees' personal evaluations of their working conditions (with regard to demands, control, obstacles, physical strain, and various consequences of change), but also on external assessments of work circumstances (such as skills requirements and physical workload). Both established questionnaire items (such as the JDC-model by Karasek) and newly constructed items by the research group were used. The whole Public Health questionnaire from the County Council of Stockholm (Arbetshälsorapporten, 1999), used several times before, was one of the instruments applied.

For the investigation of perceived consequences of change for individual work conditions we employed a specially designed questionnaire. Thirteen questionnaire items were utilised covering several aspects, such as the individual's own development opportunities, work control, participation, support, teamwork, workload, job security, salary in relation to effort, opportunities to adapt the work-family interface, gender equality, and co-determination. Respondents were requested to evaluate whether their work conditions had been affected as a consequence of changes in their work sites with regard to the aspects described above. The response alternatives were "increased", "reduced", and "unchanged". Most of the items had been constructed for a previous study of the work conditions of graduate employees in Sweden (Härenstam & Bejerot, 1995; Bejerot et al, 1998a;

b). Descriptive data on the whole study group are presented in appendix 3. Indexes are labeled Ix and variables V, both in the text below and in appendix 3, so as to facilitate the reader's search for information on indexes and variables.

Psychosocial working conditions

Self-reports by questionnaire

Demands (Ix1) reflect self-reported descriptions, obtained via questionnaire items, concerning whether subjects have to work quickly, work hard, have enough time at work, or face conflicting demands at work (Karasek & Theorell, 1990).

Control (Ix2) is the second dimension in the demand/control model, and is, in this study based on a combination of items concerned with *authority over decisions* (Ix3) and *skill discretion* (Ix4).

Control and Demands (divided by the median) were also combined into four groups: *Active job situations, High strain, Low strain and Passive job situations.*

Balance between job and private spheres (V1) is assessed by a new questionnaire item constructed and used in an earlier study of graduate employees (Härenstam & Bejerot, 2001): To what extent do you agree with the following statement: "My work is compatible with family and leisure activities": Answer categories: agree fully; agree to some extent; do not agree.

Social support (Ix7), include three questions on a) supportive relations to colleagues, b) support from managers (supervisors) and c) social cohesion at work.

Psychosocial climate (Ix12) include 10 questions on cohesion, job satisfaction, openness, mutual respect, work-place bullying, etc.

Supportive organisation (Ix13) includes 5 items on management proficiency, coping with conflicts, justice in treatment of staff, openness to ideas and initiatives.

Customer contacts (Ix6) include two questions regarding a) contacts with sick people (clients, patients etc) or people with severe problems and b) whether there are contacts with people not employed.

Obstacles (Ix5) are based here on questionnaire items concerning lack of clarity with regard to goals, and absence of resources and support.

Pay per month, for full time work (V17). Every study person was asked questions on monetary rewards for their work. All types of monetary payment are included and transformed into pay per month for a full-time worker.

External assessments

The aim of the job analysis was, as objectively as possible, to describe each individual's work from a psychosocial perspective to supplement the subjects' own descriptions and experiences of work. The job analysis instrument was based on action theory and established observational instruments developed for industrial work (Greiner & Leitner, 1989). Action theory integrates cognitive viewpoints and holds that human beings learn and develop through action (Hacker, 1993; Volpert, 1982). The instrument was adapted to be applicable to all types of occupations (Waldenström et al, 1998). Four well-trained observers who were following each study person for, usually, one day of work conducted the job

analyses. The time depended on the variation and complexity of the work tasks. A description of the organisation and interviews with supervisors provided supplementary information on the context for the work to be assessed. Interviews with the subjects were conducted in order to gain knowledge concerning mental tasks (i.e. work tasks that were not observable) as well as knowledge of work on other days than the observation day. The job analysis was performed for all 208 study persons. The group of observers had frequent meetings where experiences, difficult estimations and individual scores were discussed. The result was a common frame of reference for the group and familiarisation with all subjects for each observer. This resulted in assessments with the same criteria for all types of occupations (further description of the external assessments are found in Waldenström et al, 2003).

Studied dimensions

Each subject's work tasks along with the relative amount of time these tasks occupied constituted the work assignment. Each work task was classified according to *qualification requirements* into three categories: solving new problems or creativity, active use of occupational skills, and routine work or low mental demands.

Routine work (V7) reflects the proportion of time devoted by a subject to occupational tasks that do not impose cognitive demands. Accordingly, it can be regarded as a measure of monotonous work.

Creativity (V8) reflects the proportion of time devoted to occupational tasks that are problem solving, and cognitively demanding. Accordingly, it can be regarded as a measure of creative work.

Time-bound work (V9) reflects the proportion of time taken up by job tasks that cannot be left unattended. The worker cannot take a short break other than the regulated breaks.

Time-pressure (V10). The quantitative demands of work were described by time pressure that reflects whether enough time was provided to conduct the work tasks. Time pressure was measured by assessing for how long time, per hour, the subject could leave the work task without causing delay. If the work tasks could not be unattended for more (or even less) than the agreed breaks, the work was considered to entail *high* time pressure. If time pressure varied according to the day in the week, or if just some of the work tasks were conducted with time pressure, the category *varying/moderate* was used. If the work tasks could be performed in 80 percent of the work time paid for, time pressure was defined as *low*.

Social interaction (V11) reflects proportion of work with social interaction, necessary for performance of the job. All types of contacts are included, such as with customers, clients, colleagues and superiors. This dimension aims at describing the extent of social interaction necessary for work performance.

The creativity and routine categories were combined into two measures assessing imbalance in demands. *Mental overload* (V12) means that there was less than 5

percent of the time with routine job tasks and more than 10 percent of the time with problem solving tasks and the rest with active use of occupational skills.

Understimulation (V13) means that there is almost no time at all with cognitively demanding job tasks and more than 50 percent of the time is spent on routine work.

Change in working conditions

Extrinsic rewards (Ix14) forms an index based on three items concerning safety/ workers' protection, employment security, and pay in relation to work effort. The individual makes an assessment concerning whether these aspects had changed over the previous year. The response options were decreased, changed, and increased.

Influence and development (Ix15) forms an index based on items concerning opportunities to develop and learn something new at work, participation in operations at large, and influence and control over one's own work. The individual assesses whether this had changed over the previous year. Response alternatives were the same as for the index above.

Worry and conflict (Ix16) forms an index measuring whether organisational changes were perceived in terms of poorer task performance, perception of insufficiency with regard to personal skills/competencies, and insecurity arising from troublesome conflicts in the workplace.

Career and development possibilities (Ix17). This index is constituted of two items on how career and development possibilities had changed.

Apart from the indexes, some single variables on change are also used in the analyses, such as *Changes of work load* (V2), *Changes of influence over work* (V3), *Changes of pay in relation to effort* (V4), *Collaboration* (V5) on changes of the extent of teamwork and collaboration with colleagues and finally, *Changes of job security* (V6).

Ergonomic work conditions and related strain

<u>Self-reports by questionnaire</u>

Ergonomic-physical conditions (Ix9). This index is based upon several items on work postures, manual handling etc. from the Public Health Questionnaire from the County Council of Stockholm (Arbetshälsorapporten 1999).

Physical exertion (RPEs) (Ix8) were gathered on the basis of the questionnaire item "How physically straining do you usually find your work?" Responses were on a Borg scale (6-20) where 7 refers to extremely light work, and 19 to extremely physically demanding work (Borg, 1970).

<u>Externally assessed dimensions</u>

Two indexes were based on data gathered by means of a structured interview and an ergonomic exposure-to-load report:

Sitting position (V16) percent of work time.

Strain-related ergonomic work conditions (Ix18) encompass tasks performed while sitting or standing. When sitting, exposure consists of work with hand/ hands not in immediate proximity of the body. When standing, exposure consists of work with hand/hands above shoulder height or below knee height, i.e. with limbs extended beyond the immediate vicinity of the body or with back bent. These two cases of exposure are merged and reported as a percentage of working hours.

Two dimensions were based on technical measurements:

The percentage heart rate range[7] (%HRR) was employed as a measure of *circulatory load* (Ix19). Values are based on continuous measurements of heart rate (HR) at work, and describe the heart-rate increase as a percentage of possible increase given gender and age. It is recommended in the literature that the continuous load during an eight-hour working day should not exceed 30 percent HRR (Grandjean 1988).

Physical overload (V14). This category variable reflects excess of metabolic level based on a combination of externally assessed metabolic demands and physical function and capacity. Physical overload is defined when the metabolic demands of work[8] exceed 1/3 of the individual's aerobic capacity[9] (Karlqvist et al, 2003).

Occupational hygiene factors

Quality of general work environment (Ix10) is based on a questionnaire item where the study person is asked to evaluate the general work environment.

Chemical/physical, self-reported (Ix11). This dimension is a summation index based on several items on chemical and physical exposures at work from the Work Environment Survey (Statistics Sweden 2000).

Noise measured Db (V15). The noise level was measured by personal monitoring during two days with the use of a Brüel and Kjær Noise meter (BK 4436), with the microphone on the shoulder of the study person. The instrument measures the noise level continuously and the average for each minute was saved in the data logger. These minutes' values were transformed to a computer for further

---

[7] %HRR = 100 x (HR^{work} - HR^{rest}) / (HR^{max} - HR^{rest}). Pulse at rest (HR^{rest}) was approximated at 60 for men and 70 for women. Max pulse (HR^{max}) was calculated as HR^{max} = 210 - (0.662 x age)

[8] The external assessment of metabolic demands in work was obtained through interviews (Wiktorin at al, 1996). Each task was designated a MET value, i.e., multiples of resting oxygen consumption (1 MET=3.5 ml 0_{2*} kg body $weight^{-1}{}_{*}$ min^{-1}) (Ainsworth et al, 1993). A time-weighted average MET (TWA-MET) for one "typical working day" was calculated for each subject.

[9] Based upon submaximal test from dynamic legwork on a bicycle ergometer. The maximal oxygen consumption (1 min^{-1}) was estimated from the heart rate measured during 5th and 6th minutes of submaximal workloads and corrected for age according to Åstrand (Åstrand & Rodahl, 1986). Aerobic capacity was expressed as maximal oxygen consumption per minute and kilogram body weight. The maximal aerobic capacity was transformed to maximal metabolic capacity (TWA-MET) according to the formula: VO_2 max/3.5. The proposed upper general tolerance limit over an eight hour working day, 30% VO_2 max, was calculated, and expressed as 30% of metabolic capacity (TWA-MET) according to the formula: 0.3 * VO_2 max/3.5.

calculations. Measurements during two days were meant to cover as many work tasks as possible and to give some idea about the variation in the noise level.

Physical/chemical exposures (Ix20). This dimension is based upon several externally assessed exposures such as dust, solvents, passive smoking, motor exhaust and other chemical exposures.

Health was also assessed by means of questionnaire items. Three ill-health variables were assessed: GHQ12, an index of psychological distress (Goldberg, 1972); an index of musculoskeletal symptoms and a questionnaire item on self-reported general health. As the health indicators are not used in the present report, they are not described here.[10]

Empirical results

The relevance of organisational dimensions

In order to investigate the relevance of specific organisational dimensions, two approaches were applied: one qualitative and the other one quantitative. Results from the qualitative analyses have been presented elsewhere (Härenstam et al, 1999a) and are summarised here.

Qualitative analyses

In open-ended interviews, the individuals studied were requested to describe their working life and what they thought was significant for them (Härenstam et al, 1999a; 2000b). Early on, it was recognised that almost all of the interviewees talked a lot about how their work had changed and, frequently, how it was continuing to change. The changing environment, in itself, was appointed the main theme running through most interviews. The interviewees referred to changes that had already happened, were ongoing or were anticipated. The individual was challenged with demands for flexibility to adjust to new circumstances. Ingrained opinions concerning life-long employment or a steady position in the organisation had to be abandoned when organisations were downsized and restructured. Both negative and positive aspects of change emerged. The aspects of changes in working life – particularly at the worksite – that the interviewees considered to be important were categorised along the following dimensions:

- New technology and competence demands.
- Broken-down structures.
- Work relations.
- Time pressure and job intensity.
- Work-leisure interface.
- Control and reward systems.

[10] For information on these indexes and how they were used in the MOA-study, see Härenstam et al, 2003.

Changeability as such was identified as an important aspect to assess in future studies. New technology, demands concerning qualifications, changes to organisational structures, and control and reward systems, were among the aspects of change that were defined as important and should be assessed at the organisational level. Furthermore, the changes to work relations might be assessed both at the individual and the organisational levels, such as changes of group members and managers as well as changes in the social interaction needed for job performance. Also, the work-leisure interface can be assessed from the individual's point of view, as well as at the organisational level, by asking if a staff policy is in place that can meet the employee's interests, for example, in work schedules, family-friendly work culture etc. One ought to assess time pressure and changed job intensity at the individual level. It is an empirical question, assessed at the organisational level, whether organisational "leanness" has an impact on time-pressure and job intensity at the individual level.

The qualitative analyses of the interviews also showed that the stories were mainly characterised through accounts of either positive or negative consequences of organisational change. This illustrates the great importance of organisational changes – both as health promoters and as health hazards. The issues considered salient to subjects varied according to their work-life circumstances and, in particular, where they performed their work. The interviews could easily be categorised into groups that had similarities regarding what was said, told and how. Three aspects were identified as having an impact on the content of the interviews. These were:

- Sector.
- Type of operation.
- Object of work.

Restructuring of organisations, competition and new systems of control and reward were more contentious changes in the public sector than in the private. The development of new techniques differentiated between types of operations.[11] The results also showed the predominance of positive stories in the interviews made with individuals working in high-tech and knowledge intensive types of operations, whereas the negative stories came from human services and labour-intensive services. In work with things, people or data, – i.e., different objects of work (Kohn & Schooler, 1983) – different aspects of conditions were salient. For example, "data" work was to a higher degree boundaryless work, whereas "thing" workers stressed broken down organisational structures and further skills require-

[11] Employees at establishments grouped by types of operations identified in the qualitative analyses, were also tested in statistical analyses, applying a modified version of Giertz' classification of types of operations (2000). The results indicate that management technologies distribute risks between segments of the labor market, thus also between different groups of the labor force (Härenstam et al, 2000a; 2005). The developments were most favorable in high-tech and knowledge-based operations. The situation was least favorable in labor-intensive services and the most negative development had taken place in human services. Establishments serving as contractors seemed to organise their work differently from those with core activities. Working conditions in contracting businesses were particularly problematic.

ments. Changes in relations between different groups at work were a prominent feature when the object of work was "people", such as in caring work. These observations are in line with other research (Bejerot & Söderfeldt, 2000; Marshall et al, 1997; Jonge et al, 1999).

Quantitative analyses

The quantitative approach for identification of relevant organisational aspects was performed through the investigation of associations between disaggregated variables and indexes on organisational characteristics, on the one hand, and working conditions at the individual level, on the other. Such associations were calculated by means of Spearmans rank correlations.

The specific indexes on organisational aspects were categorised in five groups: structural aspects, change strategies, management technologies, production processes and contextual factors. A large number of indexes on working conditions (assessed at the individual level) were used in the correlation analyses. Descriptive data is presented in appendix 3. Results of the correlation analyses are presented in appendix 4 A-C, grouped in three groups of indexes: self-reported changes, self-reported "states" and externally assessed working conditions. They cover both psychosocial, ergonomic-physical and occupational hygienic aspects and are presented in-depth in the method section above.

The analyses of correlations between the separate organisational variables and separate items of working conditions show how aspects of the production process and management technologies seem to be more relevant than traditional aspects such as hierarchy. There were hardly any significant associations between structural factors and other aspects of working conditions, other than those of demands, skill discretion and decision authority. It also appears that the level of skill discretion is higher when soft technologies and economic incentives are used. Workers' control achieved higher levels in organisations with high levels of integration in the work process and in which numeral flexibilisation strategies were not common. To a large extent, work processes in which many customer contacts are needed seem to be characterised by high demands at work.

As expected, variables relating to organisational change were highly associated with changed working conditions at the individual level. Increased centralisation of power was associated with reductions in development and control possibilities for the employees. The extent of organisational changes was associated with negative consequences of changes, such as worry and conflicts in the work place. Management technologies were to large degree associated with qualification levels in job tasks. At the same time, technologies that were associated with good psychosocial working conditions showed positive correlations with good ergonomic conditions. Similarly, technologies associated with poor psychosocial conditions were also associated with poor physical and ergonomic conditions. Finally, contextual factors, such as external social interaction (for example, with other companies and with customers) and the market situation, were associated with many aspects of working conditions.

Discussion

The results indicate that those organisations which apply soft technologies, individualisation and have high innovative capacity can offer highly qualified, stimulating work tasks and high levels of control for employees. Similarly, organisations that use numeral flexibility and hard technologies also show low levels of innovative capacity and offer low qualified and standardised job tasks with few development and control possibilities. These observations indicate that specific technologies are directed at specific workers, rather than having a causal impact on working conditions. Such an interpretation is facilitated by the holistic approach presented in the following sections consisting of empirical results.

Notably, the direction of the correlations found in the quantitative analyses should not be interpreted as causal relations. Nor are the estimates very specific as the organisational dimensions are disaggregated from the establishment level. In spite of these objections, the results can be used as an empirical guide when choosing variables in forthcoming studies. Results from the quantitative and qualitative explorative analyses of relevant organisational aspects for studies of working conditions and health are mutually enhancing. Both analyses identify changes in working life as crucial. *Changeability* as such and the extent of organisational changes were related to negative consequences for working conditions. However, specific types of changes differed with regard to the direction of such consequences. As they were assessed and statistically analysed in the MOA-study, *structural aspects* of the organisation did not seem to have the kind of significance suggested in earlier theories and empirical studies (Pugh et al, 1969; Littler, 1982). Instead, *management technologies* and the implementation of *new technology* as well as *organisational changes* seem to be important. The qualitative analysis implied that structural and functional changes in organisations have detrimental effects on relations to colleagues and superiors. The increased use of *hard technologies* also seems to have negative consequences for the workers' autonomy and job content. Furthermore, *flexibilisation strategies* as well as *innovation systems* seem to be important according to the quantitative analyses. *Contextual factors* were associated with many aspects of working conditions. The interviews indicated that changes in the labour market increase the workers' general feeling of insecurity. It seems as if there has been a decrease in the significance of organisations as social systems for the worker's sense of belonging and worth in working life. The quantitative analyses also showed associations between contextual factors, such as customer relations and market situation, and working conditions at the individual level. These observations indicate that inter-organisational factors, such as the establishment's *relative position in a production chain* and its *market position*, as well as *inter-organisational relations* and *customer relations*, should be identified and included in future studies in addition to intra-organisational conditions.

Organisational structures and working conditions

This part of the MOA-study had the objective of exploring the implications for working conditions of structural phenomena at the organisational level. Some sub questions are addressed as follows:

1. By what conditions are organisations in today's working life characterised?
2. What is the impact of conditions at the organisational level on working conditions?
3. What are the associations between organisational structures and working conditions?
4. Does organisational impact on working conditions differ between groups of the work force?

Since we suggested that complex patterns and interactions between several organisational characteristics were associated with working conditions at the individual level, we also needed a classification system that could identify patterns across several organisational dimensions. For the identification of such categories, cluster analysis was chosen as the most appropriate method. These clusters of organisations were used in multi-level analyses for the investigation of organisational level impact on working conditions.

Methods

Ward´s hierarchical method was chosen (Everitt et al, 2001) for the identification of different types of work organisations with as homogenous characteristics as possible. The criteria for choosing variables were based both on theory and empirical evidence. The importance of this was drawn from qualitative analyses of interviews with managers and the results of the correlations between organisational dimensions and working conditions described above. The theoretical background is summarised in a forthcoming report (Härenstam et al, manuscript). Proceeding from these two backgrounds, it was decided that the variables should cover power structure, formalisation, integration of work process, whether the production was based on technology and/or social interaction, location of work in time and space, management technologies, market situation, customer relations and size of the work site. The final choice was also based on the metric qualities of the variables. The metrics should preferably be measured by an interval scale (or higher) or, at the very least, by an ordinal scale with several distinct categories. Twelve different indexes and variables were considered to reflect different important aspects of contemporary organisations (see table 3). Further descriptions regarding the separate variables listed in table 3 are found in appendix 1 and 2. In order to compare the variables with regard to means and standard deviations, they were transformed into z-values. The distance between the steps in Ward's cluster analysis were used as the main criteria for deciding the most appropriate number of clusters. The interpretability of the results was also taken into account.

The intention was also that the clusters should differentiate in as many aspects as possible those included in the cluster analysis.

Table 3. Description of variables included in the cluster analysis of organisations (n=81).

	Variables/indexes	Distribution		
		m	sd	Range
Power structure	X1 (v1+v4+v5+v6)	7.2	2.7	2-11
Market adjustment and state of competition	X11 (v15+v19)	4.7	1.3	2-6
Technology dependent production	X4 (v22+v24)	3.9	1.5	2-6
Production based on social interaction	X7 (v27+v42+v43)	4.6	1.8	2-9
Economic incentives	X9 (v38+v39)	3.6	1.0	2-6
Degree of integration in work process	X5 (v30+v32)	4.1	1.5	2-6
Disposition of work in time and space	X8 (v20+v21)	3.8	1.2	2-6
Degree of formalisation	v26	1.7	0.7	1-3
Use of hard technologies	v34	1.8	0.9	1-3
Use of soft technologies	v36	1.9	0.8	1-3
Staff size in number of employees at the work place	v48	1.9	0.6	1-3
Long-term customer orientation	v25	1.9	0.8	1-3

Results of pattern analyses

So as to best meet the criteria, we decided on a solution of five clusters, differing in size. We searched for names that could synthesise the most prominent features. One principle seemed applicable: where do the organisations primarily orient themselves. We chose to label the clusters: the Individual oriented, the Public oriented, the Market oriented, the Top-level oriented and, finally, the Small Enterprise organisations that comprised mainly the self-employed. The descriptions of the clusters regarding all 12 variables according to results of post hoc analyses are summarised in table 4 and presented in detail in table 5.

Table 4. Characteristics of the five patterns of organisations according to results of the cluster analysis, analyses of variance (ANOVA) and post hoc analyses (Sheffé).

Pattern of organisational structure (keywords)	Number of organisations	Most important characteristics
Small enterprises	11	Few or no employees.
Individual-oriented organisations	16	Soft control systems Low degree of formalisation High degree of long-term customer orientation High competition on the market High integration of work process Individual reward systems High IT/technology dependent production
Public-oriented organisations	13	Many social work contacts Low competition on the market Centralised power structure High degree of formalisation High integration of work process
Market-oriented organisations	18	High competition on the market Low degree of long-term customer orientation Fragmented work process Low degree of formalisation Low technology and IT dependence
Top-level oriented organisations	23	Centralised power structure High degree of formalisation Hard control systems Fragmented work process Large work sites

In table 5 we present the distribution regarding all dimensions used in the cluster analysis and results of analyses (ANOVA and Sheffé post hoc), comparing the clusters. The clusters were also compared (by means of ANOVA and Sheffé post hoc) with regard to management technologies and other dimensions than those used in the formation of the clusters (table 6). The five clusters differed significantly in most aspects analysed and most strongly with regard to the extent and range of organisational changes and also in competence-based production and functional flexibility. The Top-level oriented organisations deviated most strongly from the others. The changes were most extensive in the Top-level oriented organisations and production was to the highest degree competence based in Public oriented organisations.

Table 5.Descriptive data of the 12 indexes/variables used in the cluster analyses on organisations (n=81). Results of ANOVA analyses: means, sd, range and differences between clusters, according to Post hoc Scheffé-analyses are shown. Dark-grey shaded cells highlight the cluster(s) with the highest value and light-grey cells; cluster(s) with the lowest value.

Index/variable	Cluster:	1. Individual oriented	2. Public oriented	3. Market oriented	4. Top-level oriented	5. Small enterprise	F	P
X1	Structure of power mean (sd)	6.19 (1.9)	8.62 (1.4)	7.33 (1.7)	9.26 (1.3)	2.27 (0.5)	47.7	.000
	High: centralised range	(3-10)	(7-11)	(5-10)	(5-11)	(2-3)		
	Deviation from cluster nr	2, 4, 5	1, 5	4, 5	1, 3, 5	1, 2, 3, 4		
v26	Formalisation	1.38 (0.5)	2.08 (0.5)	1.22 (0.4)	2.35 (0.7)	1.09 (0.3)	18.5	.000
	High: great extent	(2-3)	(1-3)	(1-2)	(1-3)	(1-2)		
	Deviation from cluster nr	2, 4	1, 3, 5	2, 4	1, 3, 5	2, 4		
v34	Use of hard technologies	2.13 (0.8)	1.23 (0.6)	1.28 (0.6)	2.65 (0.5)	1.36 (0.7)	19.0	.000
	High: great extent	(1-3)	(1-3)	(1-3)	(2-3)	(1-3)		
	Deviation from cluster nr	2, 3	1, 4	1, 4	2, 3, 5	4		
X11	Competition on the market	5.38 (0.5)	3.00 (0.9)	5.33 (0.7)	4.65 (1.2)	4.55 (1.6)	12.8	.000
	High: large	(5-6)	(2-4)	(4-6)	(2-6)	(2-6)		
	Deviation from cluster nr	2	1, 3, 4, 5	2	2	2		
v25	Customer orientation	2.69 (0.6)	2.46 (0.5)	1.33 (0.5)	1.57 (0.7)	1.55 (0.5)	16.7	.000
	High: large extent	(1-3)	(2-3)	(1-2)	(1-3)	1-2)		
	Deviation from cluster nr	3, 4, 5	3, 4, 5	1, 2	1, 2	1, 2		
X8	Disposition of work	4.25 (1.1)	3.46 (1.3)	3.89 (1.5)	3.78 (1.1)	3.27 (1.3)	1.3	.281
	High: atypical in time& space	(2-6)	(2-5)	(2-6)	(2-6)	(2-5)		
	Deviation from cluster nr	0	0	0	0	0		
X9	Economical incentives	4.44 (0.8)	3.85 (0.6)	2.83 (1.0)	3.26 (1.0)	3.73 (0.7)	8.8	.000
	High: Performance related pay	(3-6)	(2-4)	(2-4)	(2-5)	(2-4)		
	Deviation from cluster nr	3, 4	3	1, 2	1			
X7	Social interaction-based prod.	5.19 (1.9)	5.85 (1.6)	3.72 (0.9)	4.78 (1.4)	3.09 (2.1)	6.9	.000
	High: common	(2-9)	(4-9)	(3-6)	(3-7)	(2-9)		
	Deviation from cluster nr	5	3, 5	2	0	1, 2		
X5	Integration of work process	4.56 (1.5)	4.69 (0.8)	3.44 (1.3)	3.00 (1.0)	5.91 (0.3)	16.7	.000
	High: Highly integrated	(2-6)	(4-6)	(2-6)	(2-5)	(5-6)		
	Deviation from cluster nr	4, 5	4	2, 5	1, 2, 5	1, 3, 4		
v36	Use of soft technologies	2.44 (0.7)	2.23 (0.6)	1.72 (0.8)	1.65 (0.7)	1.18 (0.4)	7.8	.000
	High: commonly used	(1-3)	(1-3)	(1-3)	(1-3)	(1-2)		
	Deviation from cluster nr	3, 4, 5	5	1	1	1, 2		
X4	Technology-based production	5.13 (1.1)	2.62 (0.9)	3.17 (1.3)	4.65 (1.2)	3.36 (1.0)	14.0	.000
	High: large extent	(3-6)	(2-4)	(2-5)	(2-6)	(2-5)		
	Deviation from cluster nr	2, 3, 5	1, 4	1, 4	2, 3	1		
v48	Size of organisation	1.94 (0.6)	2.15 (0.6)	1.89 (0.5)	2.30 (0.6)	1.00 (0.0)	13.2	.000
	High: > 150 employees	(1-3)	(1-3)	(1-3)	(1-3)	(1-1)		
	Deviation from cluster nr	5	5	5	5	1, 2, 3, 4		

Table 6. Comparisons of the clusters on indexes not encompassed by the cluster analysis. Cells marked in grey deviate most strongly from the others according to post hoc analyses (Sheffé). N=81

Index no.	Indexes not encompassed by the cluster analysis	Cluster	1. Individual oriented n=16	2. Public oriented n=13	3. Market oriented n=18	4. Top-level oriented n=23	5. Small enterprise n=11	F	p
X13	Numeral flexibility	Mean	6.46	5.62	6.17	6.52	not		ns
		Sd	1.46	0.77	0.92	1.34	assessed		
	Deviation from cluster		-	-	-	-			
X14	Functional flexibility	Mean	5.67	5.23	4.44	5.52	not	3.9	.02
		Sd	1.18	0.93	0.70	1.2	assessed	6	
	Deviation from cluster		3	-	1, 4	3			
X3	Changes to organisation	Mean	1.94	3.08	2.06	3.61	1.09	8.5	.000
	& production process	Sd	1.12	1.38	0.94	1.95	0.30		
	Deviation from cluster		4	5	4	1, 3, 5	2, 4		
X18	Competence based-	Mean	3.94	4.15	2.56	3.13	2.73	5.6	.001
	production	Sd	1.65	1.14	0.62	1.22	0.79	3	
	Deviation from cluster		3	3	1, 2	-	-		
X2	Competence structure	Mean	6.0	7.0	3.39	4.09	3.91	9.4	.000
	Deviation from cluster	Sd	2.66	2.2	1.2	1.62	2.0		
			3	3, 4, 5	1, 2	2	2		
X10	Number of aspects that	Mean	2.75	4.08	2.28	6.17	0.72	9.5	.000
	were changed	Sd	2.05	3.04	1.53	4.03	0.65	5	
	Deviation from cluster		4	-	4	1, 3, 5	4		

Where in the labour market do we find the different clusters of organisations?
Descriptive analyses were performed in order to investigate if the five clusters of organisations congregated in certain parts of the labour market (table 7). The clusters were compared by chi^2 analyses with regard to contextual and background information that were available as categorical variables.

These analyses showed, for example, that the five clusters had to a large degree different types of operations. Almost all of the Market-oriented organisations had so called labour-intensive service production and more than half of them were sub-contractors and the lowest levels of in-house training and in-house mobility were found here. All Top-level oriented organisations were part of larger organisations. Being part of a chain of organisations was most common in the Top-level oriented and the Market -oriented organisations. Analyses presented in tables 6 and 7 are intended as a validation of the clusters as well as a contributing further information to facilitate interpretation of the results.

The cluster named "*Individual oriented*" mainly comprised work sites in the private sector in high-tech/IT and knowledge intensive production, such as consulting firms within marketing and IT, juridical and financial companies, and media. More than half of them had male-dominated staff. Work sites in the cluster called "*Public oriented*" were mostly in the public sector with female-dominated staff and included county council administrations, hospitals, schools, a prosecutor, social services, childcare and elderly care institutions. The *"Market-oriented"*

cluster comprised mainly work sites in the private sector with labour-intensive service production. This cluster contained service enterprises such as within security, transport, maintenance and restaurants. The *"Top-level oriented cluster"* comprised large work sites, mostly in the private sector, and many of them in chains of enterprises. All were part of a larger corporation and the cluster contained a bank, a post office, a police district, a hospital, large scale industrial plants, construction companies, assembly companies, agencies (cleaning, call-centres and office services), transport, petrol, super market and hotel companies, and a food-processing plant. The work sites in the *"Small enterprise"* cluster were all in the private sector and contained hairdressers, catering, free-lance journalists/ photographer, craftsmen and farmers.

Table 7. Descriptions of the five clusters (percentage within each of the clusters) and results of chi2 analyses regarding dimensions not included in the cluster analyses. Cells marked in grey deviate most strongly from the others in significant analyses.

Variables %	Individual oriented (n=16)	Public oriented (n=13)	Market oriented (n=18)	Top-level oriented (n=23)	Small enterprise (n=11)		
n=81	16	13	18	23	11	Chi2	p
Employer						45.6	.000
Public	0	92	17	17	0		
Publicly owned company	12	0	6	9	0		
Private	88	8	84	74	100		
Type of trade						83.9	.000
High tech/IT & knowledge-based production	54	0	0	14	18		
Human service production	8	100	6	9	0		
Labour-intensive service production	39	0	94	64	55		
Labour-intensive goods prod.	0	0	0	14	27		
Subcontractor	19	0	56	30	18	13.3	.01
Chain organised	25	0	39	39	0	12.4	.02
Part of larger organisation	47	92	50	100	Not ass.	27.0	.000
Changed ownership conditions	13	0	11	22	9		ns
Gender distribution at the work site							ns
Male-dominated (>70% men)	56	8	50	35	36		
Female-dominated (>70% wom)	19	46	22	26	46		
Gender segregation in the workplace						13.9	.03
Large	50	8	44	57	Not ass.		
Staff reduction						16.9	.01
Large	6	23	22	52	Not ass.		
Proportion temporary employees							ns
>30%	33	15	22	13	Not ass.		
Extensive in-house training	27	15	6	30	Not ass.		ns
No in-house mobility	13	23	67	35	Not ass.	15.4	.02
Job expansion[12] Extensive	0	0	0	17	Not ass.	13.8	.03
None	44	54	78	57	Not ass.		
Competence structure						43.0	.01
Low <5	44	23	44	74	82		
High >7	50	62	6	4	0		
Access to OHS	53	85	72	96	Not ass.		.02
Pattern of organisational changes						39.6	.000
Stable	40	62	17	0	Not ass.		
Centralising	7	8	0	22	"		
Market adjusting	33	0	72	26	"		
Increased standardising	13	8	6	26	"		
Lean production	7	23	6	26	"		

[12] Extensive job expansion meant that employees had got more job tasks, new and more complex job tasks during the last year.

Working conditions in four different patterns of organisational characteristics
Several self-reported and externally assessed working conditions were used in order to explore the association between pattern of organisation and working conditions at the individual level. The cluster labelled "small enterprise" was excluded in these analyses as it encompassed primarily self-employed (which means that they were informants of both organisational and individual conditions). Working conditions for 204 women and men in the remaining four clusters of 70 organisations were investigated (table 8 and 9). As tests of whether further analyses would be worthwhile to perform, differences between the four types of organisations were investigated by mean of analyses of variance (ANOVA) or chi^2. Finally, by means of multi-level analyses, the organisational impact on working conditions was explored as well as the consequences for different groups of workers.

Significant differences in mental overload, under stimulation, time pressure and time-bound work (according to analyses of variance) were found in the uni-variate analyses. The worst conditions with regard to mental overload and time-pressure were found in Public-oriented organisations in which active jobs were most common. Time-bound work and physical overload and low levels of control were most common in the Top-level oriented and Market-oriented organisations. Extensive job expansion was most often found in Top-level oriented organisations in which high strain jobs were also most common (table 8).

The analyses were also performed in gender-differentiated analyses. Type of organisation was associated with both demands, decision authority and skill discretion for the women but only with skill discretion for the men. The men reported the highest levels of skill discretion in the Individual-oriented organisations. Women in the same type of organisation also reported high levels of demands. Women in the Top-level oriented organisations reported high levels of demands and low levels of skill discretion. Women in the Market-oriented organisations reported both low levels of demands and low levels of skill discretion.

Table 8. Proportion of study persons with self-reported and externally assessed working conditions within organisations grouped by clusters of organisational structures. Chi^2-analyses.

	Structure pattern				
Percent of workers in studied organisations	Individual oriented	Public oriented	Market oriented	Top level oriented	p-value
Active jobs (self-reported)	37	46	9	24	.02
High strain jobs "	17	16	12	20	
Low strain jobs "	23	24	36	21	
Extensive obstacles (externally assessed)	47	82	32	52	.000
High level control, externally assessed	29	21	5	5	.000
More qualified job tasks last year, externally assessed	42	38	39	49	.001

Table 9. Self-reported and externally assessed working conditions in four patterns of organisational structures, n=204. Results of ANOVA analyses for indexes and chi^2 analyses for categorical data (results shown as percent). Shaded cells mark the category with the worst working conditions. Bold figures mark the categories with the best conditions.

			Individual oriented n=32	**Public oriented** n= 39	**Market oriented** n= 37	**Top-level oriented** n=96	F	p	Drop -out (n)
Self-reported changes	Extrinsic rewards	Mean. Sd	**6.2 (0.7)**	5.7 (0.9)	5.6 (1.3)	5.5 (1.1)	2.8	.04	(17)
	Influence and development	Mean. Sd	**9.3 (2.0)**	8.2 (1.6)	8.7 (1.5)	9.1 (1.6)	3.2	.02	(17)
	Worry and conflict	Mean. Sd	**4.6 (1.6)**	5.7 (1.5)	5.1 (1.8)	5.5 (1.6)	3.2	.00	(20)
Self-reported working conditions	Demands	Mean. Sd	13.5 (3.0)	14.2 (3.3)	**11.9(2.9)**	13.1 (2.9)	8.3	.00	(14)
	Control	Mean. Sd	**19.2 (3.0)**	19.0 (3.1)	16.6 (3.1)	16.7 (3.1)	8.3	.000	(8)
	Obstacles	Mean. Sd	16.6 (4.2)	18.8 (3.1)	**15.8 (3.2)**	18.2 (3.9)	5.0	.01	(16)
	Social support (high= low supp)	Mean. Sd	**4.6 (1.5)**	5.8 (1.6)	5.3 (1.8)	5.3 (1.7)	2.8	.05	(24)
	Customer contacts	Mean. Sd	4.5 (1.3)	5.9 (2.0)	4.5 (1.8)	**3.9 (2.1)**	9.1	.00	(4)
	Physical exertion	Mean. Sd	**10.5 (3.1)**	12.3 (3.0)	12.9 (2.8)	12.8 (3.1)	5.1	.00	(11)
	Ergonomic conditions	Mean. Sd	**7.4 (2.0)**	7.8 (2.1)	10.0 (3.1)	8.7 (3.0)	6.6	.00	(5)
	Chem./physical exposures	Mean. Sd	23.0 (7.6)	**21.3 (4.1)**	28.5 (6.2)	27.1 (7.3)	10.9	.00	(5)
	Work-family balance	% Low	47%	21%	42%	34%		ns	
	Pay	% Low	**22%**	31%	36%	**21%**	17.9	.00	(2)
Externally assessed working conditions	Routine work	Mean. Sd	29.3 (23.5)	**13.2 (14.5)**	51.9 (24.1)	30.0 (26.9)	20.6	.00	(0)
	Creativity	Mean. Sd	**12.4 (10.5)**	10.6 (5.3)	2.0 (3.0)	4.7 (6.5)	21.5	.00	(0)
	Time-bound work	Mean. Sd	19.9 836.3)	22.5 (31.1)	26.3 (41.0)	26.8 (37.0)		ns	0
	Time-pressure	Mean. Sd	30.6 (42.6)	44.4 (40.8)	30.4 (39.3)	**20.6 (37.7)**	3.4	.02	0
	Complex social work	Mean. Sd	54.1 (35.9)	62.4 (31.5)	40.2 (44.0)	**37.1 (40.6)**	4.4	.01	0
	Circulatory load	Mean. Sd	19.7 (8.0)	19.3 (6.8)	22.2 (8.5)	20.1 (7.4)	1.1	ns	(3)
	Ergonomic strain	Mean. Sd	15.8 (20.0)	**14.6 (12.1)**	40.6 (26.8)	27.5 (22.0)	12.3	.00	(18)
	Sitting position	Mean. Sd	68.8 (26.9)	57.1 (24.4)	**45.9 (31.6)**	**46.2 (34.2)**	4.9	.00	(5)
	Noise	Mean. Sd	76.1 (5.7)	76.7 (4.5)	78.2 (4.3)	77.7 (5.5)	1.4	ns	0
	Phys/chemical exposures	Mean. Sd	7.1 (2.0)	**6.8 (1.1)**	8.2 (2.4)	8.5 (2.89	6.0	.00	0
	Mental overload	Mean. Sd	21.9%	38.5%	**2.7%**	7.3%	27.3	.00	0
	Under-stimulation	Mean. Sd	3.1%	**2.6%**	27%	20.8%	14.4	.00	0
	Physical overload	Mean. Sd	17%	19%	29%	28%		ns	

Results of multi-level analyses

The next question was to investigate whether the differences between the clusters that were found in the uni-variate analyses (table 9) could be explained by other factors than those of organisational structures, such as differences in gender-distribution at the work place and a different distribution of less and highly educated individuals in the clusters of organisations. In earlier research, gender segregation in the labour market has been identified as a major explanation of the differences between women's and men's working conditions and work-related health (Kauppinen & Kandolin, 1998; Messing et al, 1994; Matthews et al, 1998).

Applying multi-level analysis to this material is logical, since we had data at two levels (the individual level and establishment level). The variance is wrongly estimated if such data are disaggregated, and employed within the confines of a standard regression model (Snijders & Bosker, 1999). Multi-level analysis is a kind of regression analysis at two (or more) hierarchical levels, with the outcome at the lowest level and the possibility of including explanatory variables at all levels. Multilevel analysis is based on a "null" model that splits variance between levels (in this case, the individual level and establishment level). Multilevel analysis is only worthwhile if the second level contributes significantly to the explained variance in the outcome (in our case; working conditions). It is therefore important to test this before further steps of multilevel analyses are taken. One way of doing this is to calculate intra class correlation coefficients in an empty model, i.e. without any predictors. This step in multi-level analysis also provides information concerning how much variance is to be found at each level, and how much certain variables can explain the variance at their own level.

Every regression coefficient at the lowest level (the individual one) becomes an outcome at the next (the establishment level). This means that a variable at the individual level can have different relations with the outcome according to the type of organisation in which the individual is located. Thus, it was possible to investigate whether differences between patterns of organisational structures and gender composition (i.e. contextual factors) could be explained by different distributions among the staff regarding sex and education level (i.e. compositional factors) (Diez-Roux, 2002; Duncan et al, 1998). In the present study, educational level and sex were also used to explore whether working conditions for different types of individuals were affected in different ways by organisational structures. This means that we were able to explore and separate the impact of contextual and compositional effects as well as to explore between-level effects (Diez-Roux, 2002; Duncan et al, 1998).

After testing the models both with and without allowing the residual variances of the slopes to vary, it was decided to allow only the intercept to vary and keep the slopes fixed (Snijders & Bosker, 1999). Men employed in gender-mixed, individual-oriented organisations constituted the reference group for the category variables. A random intercept model of multilevel analysis, including explanatory variables at both the individual level (education and gender) and organisational level (pattern of organisational structures and gender composition), was chosen as the first step.

Several aspects of psychosocial, ergonomic-physical and occupational hygiene conditions were used as outcomes in multi-level analyses. Among these, routine work, straining ergonomic conditions, noise and circulatory load, were externally assessed and the others were based on self-reports by means of questionnaire data. The distribution of the variables included in the multi-level analyses is shown in table 10. The variables are described in appendix 3. SAS PROC MIXED (1996) was employed for these analyses.

Tabell 10. Description of dimensions reflecting self-reported and externally assessed working conditions, n=204.

Variables	Distribution		
	m	md	Min-max
Demands (Ix 1)	13	13	6-20
Control (Ix2)	17	18	10-24
Routine (V7, externally assessed % of work time)	34	26	0-100
Obstacles (Ix5)	18	17	10-27
Supportive organisation (Ix13)	17	17	7-25
Psychosocial climate (Ix12)	31	31	14-41
Ergonomic strain (Ix18, externally assessed % of work time)	25	19	0-88
Physical exertion (Ix8)	12	13	6-18
Circulatory load (Ix22, %HRR)	20	19	6-42
Noise, measured Db (Ix19)	77	77	67-91
Quality of general work environment (Ix10)	6	6	0-10

Educational level was a continuous variable, with values centered on the mean for the entire group (mean: 7.35 semesters, range 0–26). Educational level was measured as the number of half-year semesters of higher education following basic education.

The second level predictors, (i.e. at the contextual level), were gender distribution (male and female dominated work sites and gender mixed work sites i.e. less than 70 and more than 30 percent of each sex as the reference group), and type of organisation (with individual-oriented organisation as the reference group).

According to the intra class correlation coefficients (ICC) presented in table 10, a large part of the variance could be attributed to the organisational level, especially with regard to strenuous work postures, routine work, noise, and control (crude ICC in column A). Column B, C and D show ICC when the analyses are adjusted for predictors at the organisational level. Decreases in ICC as compared to the crude ICC are expected if the explanatory variable is important in relation to the outcome. The table shows that gender composition at the work place significantly contributed to the explained variance in obstacles and routine work (Column B). Pattern of organisational structures contributed to a significant proportion of the explained variance in strenuous work postures, routine work, control, obstacles, physical exertion and demands (Column C). When both gender composition and pattern of organisations were included in the same model (Column D), the impact of gender composition was no longer a significant predictor of any of the outcomes in earlier models. However, gender composition

turned out to be a significant predictor of job control when included in the analyses together with pattern of organisational structures.

The proportion of the total variance explained when both the contextual factors were included was not the same as the sum of them when included one at a time, as there were interactions that altered the proportion of the variance explained (Snijders & Bosker 1999, pp 99-105). In several of the multilevel analyses, it seems as if the two independent contextual variables were highly correlated as the variance attributed to the organisational level did not decrease when the models were adjusted for both of them.

Table 11. Summary of results of the multilevel analyses (204 individuals, 72 workplaces) of eleven different outcomes (working conditions). Intra-class correlation coefficients (ICC), i.e. explained variance attributable to the second level in four models of multilevel analyses.

Outcome variables	A %	p-value[1]	B %	p-value[2] gender distrib	C %	p-value[2] org. structure	D %	p-value[2] gender distr	p-value[2] org structure
Strenuous work postures	66.0	**	66.2	ns	60.7	**	61.5	ns	*
Routine work	46.1	**	43.9	_	29.7	**	30.0	ns	**
Noise, measured Db	44.0	**	43.5	ns	44.3	ns	43.5	ns	_
Control	37.7	**	39.1	ns	29.4	**	30.1	*	*
Obstacles	23.2	*	20.6	*	19.5	**	18.4	ns	ns
Physical exertion	21.8	*	21.9	ns	18.0	**	18.0	ns	**
Supportive organisation	20.8	_	22.7	ns	22.5	ns	24.4	ns	ns
Psychosocial climate	17.8	_	18.9	ns	17.1	ns	18.5	ns	ns
Demands	15.3	_	11.9	ns	14.1	*	12.9	ns	ns
Occ. hygiene conditions	9.1	ns	9.1	ns	9.8	ns	9.9	ns	ns
Circulatory load (%HRR)	9.7	ns	12.8	ns	10.1	ns	13.4	ns	ns
Sum of analyses p<0.10		9/11		2/11		6/11		1/11	5/11

[1] Model A) Empty model (no predictors at any of the two levels). Proportion of total variance attributable to organisational level (remainder up to 100 per cent attributable to individual level).
B) Proportion of variance attributable to the organisational level adjusted for gender distribution (three categories: male-dominated, gender-mixed and female-dominated).
C) Proportion of variance attributable to the organisational level adjusted for pattern of organisational structures (four categories).
D) Proportion of variance attributable to the organisational level adjusted for gender distribution and pattern of organisational structures (four categories).

[1] Level of significance for the 2nd level intercept residual variance. Significant levels for the random intercepts: ** p<.01, * p<.05, _ p<.10.

[2] Level of significance from the tests of fixed effects. Significant levels: ** p<.01, * p<.05, _ p<.10.

A complete model, including all explanatory variables at both the individual and the workplace level, provided a starting-point for further analysis. Even though ICC is not shown in the table since the results (significance levels) were exactly the same as in table D (table 11), it was also calculated for this model. Organisational structure (at the organisational level) was a significant predictor in the same five analyses (strenuous work postures, routine work, noise level, control and

physical exertion) as in model D, even when individual factors (gender and education level) were adjusted for. Gender-composition at the work place was a significant predictor of job control even when individual factors (gender and education level) were adjusted for.

Non-significant variables were removed one by one, starting with the one with the lowest significance (i.e. the highest *p*-value), until a final model encompassing only explanatory variables significant at the ten-percent level was produced. The ten-percent level of significance was chosen as the sample of individuals was small. However, variables with significant cross-level interactions were not removed even if they did not reach the ten-percent significance level as a separate variable. Summary descriptions of these final models are provided in Table 12.

The results show that the lowest level of control is found in female-dominated, Market-oriented and Top-level oriented organisations. Women have lower levels of control than men do in all situations except in female-dominated organisations: 19.35 –1.57 +2.61. This last result means that both gender-composition at the work place and gender at the individual level should be taken into account when examining job control.

Physical exertion was reported as lower the higher the educational level and it was highest in Public-oriented organisations. The noise level was highest in Market-oriented organisations, but only for the men; 75.50+4.39 Db. Predicted value for women in the same organisations would be: 75.50+4.39-5,55 Db. Furthermore, the results show that the noise level was lower, the higher the education level of the employee. But this holds only for gender-mixed and male-dominated establishments. In the female-dominated work places, the higher educated individuals had slightly higher noise level than the low educated; 0.08 Db (-0.37 +0.45) increase above the intercept of 75.50 Db by each semester of education above basic school. For example, a physician in a female-dominated Public oriented organisation, having 22 semesters of education beyond compulsory schooling (i.e., 14.65 semesters above the mean), should have a predicted noise level of 75.50+3.51 +(14.65 x 0.08) = 80,26 Db.

Proportion of time with routine work was highest in Market-oriented organisations. Women had twice as much routine work (17.80+25.92) as men in Individual-oriented and gender-mixed organisations (the reference category). Women had less or a similar amount of routine work as compared to the men in the other clusters of organisations. To be a woman in a Top-level oriented organisation seems to be associated with much more obstacles at work than for men in the same type of organisation.

Table 12. Summary of results of the multi-level analyses. Relationships between explanatory variables at the individual level (Level 1) and workplace level (Level 2), and eleven aspects of working conditions. Only estimates for variables remaining in the final model (statistically significant at the ten-percent level), including estimates for non-significant categories and for variables having significant cross-level interactions, are shown. Significance levels: ** p<.01, * p<.05, † p<.10.

Explaining variables		Control	Demands	Obstacles	Climate	Sup. organi-sation	Phys excert.	Occ. hygiene	Routine	Straining work postures	Noise	Circ. load
How Level 2 affects the intercept	Intercept	19.35	13.12	17.59	31.06	17.67	10.67	6.23	17.80	17.69	75.50	21.71
	Male-dom	0.32										
	Female-dom	-1.82 †										
	Public	0.04					2.82**		10.19	-0.27	3.51 †	
	Customer	-1.65 †					1.56*		36.70**	17.82*	4.39*	
	Top-level	-1.83*					1.73*		21.05**	9.10	2.81 †	
How Level 2 affects the slope for gender (Level 1)	Intercept wom.	-1.57*							25.92**			-3.53**
	Male-dom	0.88							-10.70 †			
	Female-dom	2.61**							-15.81**			
	Public			0.68					-23.57*		-1.77	
	Customer			-0.13					-32.43**		-5.55**	
	Top-level			3.07*					-24.27**		-3.70*	
How Level 2 affects the slope for educational level* (Level 1)	Intercept education	0.19**		0.18**			-0.22**		-1.97**	-0.01	-0.37**	-0.36*
	Male-dom										0.14	-0.15
	Female-dom										0.45**	0.41 †
	Public		0.35**									
	Customer		0.39*									
	Top-level		0.09									
2nd level intercept residual variance	var (u_{oj})	2.38	1.41	2.50	5.02	2.68	1.53	0.43	115.02	0.03	11.18	7.06
1st level residual variance	var (e_{ij})	6.42	7.23	11.51	23.13	10.19	6.59	4.29	343.01	0.02	12.39	46.52

Notes to Table 12

Exemple: A man in a gender-mixed, individual oriented organisation with an educational level that is equivalent to the mean for the whole group (that is the reference category), has according to the table 19,35 in control. In order to calculate the predicted estimate for a man at the same educational level, in a female-dominated, Top-level oriented organisation; start with 19.35, minus 1.82 (for female-dominated organisation), minus 1.83 (for Top-level oriented organisation), which give a number of 15.7 of control. To calculate the predicted estimate for a woman in the same situation you have to reduce the number with 1.57 (for female sex) and then add 2.61 (for being a woman in a female-dominated organisation (that is 16.74). In similar vein, calculations of predicted estimates can be done for different combinations of conditions at the organisational and individual level.

Discussion

Characteristics of contemporary organisational structures

The cluster analyses revealed five patterns of organisational characteristics, categorised by a free interpretation of information that synthesised the most prominent features, following the same principal for all clusters. In this case, we chose to focus upon external relations, or rather where the organisations primarily oriented themselves to or were controlled by; the Individual-oriented, the Public-oriented, the Market-oriented, the Top-level oriented. As it comprised mostly self-employed, the small cluster, named Small Enterprise organizations, was excluded from most of our analyses.

The Top-level oriented organisations seemed to be controlled by and orient themselves towards the top-level of the corporation that they were connected to. Thus, it seemed to us that such center corporations use "remote control", as they act from a distant position in relation to production itself. It should be noticed that all establishments in this cluster were part of a larger organisation. The Public-oriented organisations seemed to be controlled by and oriented towards citizens or rather their political representatives. Production needed extensive and complex social interactions with consumers, managers at different levels in the organisation as well as external relations with other Human service organisations and with political representatives. The organisations in the Market-oriented cluster were acting in a highly competitive market with short-term relations to customers. Possibly these organisations were structured so as to achieve as low labour costs as possible in order to meet market demands. Here we find the lowest level of competence dependent production and the lowest level of in-house training, and a large proportion of temporary employees. The Individual-oriented organisations were characterised by principles that seem to attract core employees (such as soft management technologies, individualised reward systems, low degree of formalisation, and being in the frontline of high technology). As the Market-oriented organizations, these organisations were also acting in a highly competitive market, but as opposed to them they had long-term customer relations. This difference might contribute to explaining why they had different organisational structures and strategies.

The differences between the clusters of organisations are supported by statistical analyses. The within-group homogeneity of each of the clusters was satisfactory with regard to the dimensions they were based on. All single dimensions but one discriminated between the clusters. The post hoc analyses also showed that the clusters did not differ in all aspects but could also be overlapping in some aspects. Anova and post hoc analyses were performed for a variety of other variables on data at the work site level, comparing the different clusters of organisations. These analyses demonstrate differences between the clusters in 5 out of 6 management technologies (table 6).

We also found that the five clusters of organisations congregated in different parts of the labour market, particularly with regard to gender segregation, competence level of the staff, and type of production. Twelve of 16 such comparative analyses showed significant differences (table 7). This observation indicates that

the Swedish labour market is very segmented and that certain types of organisations are linked to certain types of production and directed at certain groups of the labour force. For example, functional flexibility (i.e. more job tasks, high in-house mobility and training) was very common in the Top-level oriented organisations in which the lowest levels of vertical and horizontal integration of work were found. Many of these organisations were found in the labour-intensive service sector (such as hotel, super-market, post and bank offices, cleaning agencies, call-centers and transportation companies) and had a high proportion of less educated employees. This might be interpreted as front-line workers being given many more job tasks and responsibilities, while the power structure is still very centralised and the production process is fragmented. The new job tasks were mostly of the same type as the older ones, and at the same vertical level. That is to say, job expansion seems to be in place rather than job enrichment. Similar results were found in a French study (Greenan & Mairesse, 2003) and have been recognised and discussed by Thompson and McHugh (2002).

Furthermore, all establishments in the cluster in which the power structure was centralised, integration of the work process was highly integrated and based on social interactions, and in which competition on the market was low, had human service production and 92 percent of them were publicly owned. On the other hand, all establishments except one in the Market-oriented cluster had labour-intensive service production and the proportion of subcontractors was highest. In-house training and access to occupational health services were least common in these establishments. The Public-oriented and the Market-oriented organisations differed with regard to competence structure of the staff and on working conditions. Both had problematic conditions but not in the same way. Thus, classifications of types of operations, position and ownership seem to be a useful way to compare organisations with regard to working conditions. The establishments included in the present study were chosen to achieve large variation. Thus, it is easier to detect differences between extremes rather than differences between establishments within similar types of production.

Organisational impact on working conditions

The multi-level analyses demonstrated that conditions at the work place level were associated with several aspects of working conditions at the individual level even when individual characteristics were adjusted for. The variation in working conditions at the individual level that was attributed to the organisational level, varied between 9 and 66 percent in the present study. The highest proportion of variance was found in physical and ergonomic aspects. But, the variance in complexity in job tasks and workers' own control was also high (46 and 38 percent, respectively). This means that the impact of organisation level conditions on individual level working conditions seems to be great. Type of organisational structure had the highest explanatory power in control and routine work. Gender composition of the staff did not show significant association in more than one aspect (control), when the other predictors were included. The best working conditions in most aspects were found in Individual-oriented organisations. The

worst conditions with regard to many of the psychosocial aspects were found in Public-oriented and female-dominated organisations. However, we find the lowest levels of control, low complexity in job tasks and also the worst physical and ergonomic conditions Market-oriented organisations. It is interesting to note that none of the self-reported indexes of organisational conditions (psychosocial climate and supportive organisation) showed any association with the predictors at the organisational or the individual levels although approximately 20 percent of the variance was attributed to the organisational level. Individual's perceptions of such aspects seem to have other origins than the structural organisational conditions chosen as predictors here.

Organisational impact on working conditions for different groups of the work force

The results indicate that gender-composition interacted with individual characteristics. For example, women reported less influence over work than men in all situations except in female-dominated ones. Furthermore, workers with a high education had better physical/ergonomic working conditions than the less educated in all organisations except the female-dominated. In general, highly educated individuals had lower noise levels and lower circulatory load than the less educated ones. But this was not true in female-dominated work sites. It is an interesting observation with regard to the issue of increasing work-related illness in female-dominated segments of the labour market. It also seems as if highlevel education does not act as a safeguard for poor working conditions in the Public-oriented organisations. Gender interacted with conditions at the organisational level particularly with regard to level of control and routine work. Women in the present study did not benefit as the men did from the conditions in the cluster of organisations with the best working conditions: the Individual oriented. These analyses indicate that there is a gender related difference at a structural level in influence and concerning the qualification level of work as well as in some physical/ergonomic aspects.

Organisational changes and working conditions

The objective of this part of the MOA-study was to explore the implications for working conditions of organisational changes. Some questions are addressed as follows:

- By what are organisational changes in today's working life characterised?
- What is the impact on working conditions of organisational changes in work places?
- What are the associations between organisational change and working conditions?
- Do associations between organisational change and working conditions differ between groups of the work force?

Methods

The same methodology as in the investigation of organisational structures was chosen for the categorisation of organisational changes. Organisational change can be regarded as a "latent" variable, indicated by several aspects, clustered together (Greenan & Mairesse, 2003). The eleven variables/indexes encompassed by the cluster analysis were theoretically and empirically based. Qualitative analyses of interviews with employers and employees identified certain aspects that were particularly important with regard to impact on working conditions (Härenstam et al, 2000b). These results aided us in the selection of dimensions for the cluster analysis of organisational change. Six of the chosen variables concern various aspects of organisational change. Further, an index of the number of aspects that had been changed at each work site was included (range 0-12). An additional four variables describing organisational characteristics at time of rating were used (table 13). The variable "change in staff size" was not included, since this dimension was not classified in such a way that would have enabled differentiation between "downsizing", "outsourcing" and "divisionalisation". Frequencies regarding each of the dimensions were calculated. All variables were standardised (i.e. given z values with the same mean and standard deviation).

Work sites with only self-employed persons were excluded. Thus 72 work sites were included in the cluster analyses. The results of the cluster analysis are presented as descriptions of the characteristics of each of the clusters of organisational change. Further descriptions on the methodology and empirical results are presented elsewhere (Härenstam et al, 2004).

Table 13. Variables and indexes on organisational change and structures (levels) encompassed by the cluster analysis for the identification of patterns of change.

Change	Variable no	Mean	Sd	Min-max
Power structure	v8	2.08	0.47	1-3
Vertical and horizontal integration of work process	X6 (v31+v33)	4.26	0.71	3-6
Hard control system	v35	2.22	0.42	1-3
Organisation and production process	X3 (v23+v28)	2.68	1.61	1-6
Soft control system	v37	2.14	0.35	1-3
Qualification requirements	v58	1.67	0.67	1-3
Number of aspects changed	X10	3.90	3.32	0-12
Levels				
Power structure	X1 (v1+v4+v5+v6)	7.79	2.12	3-11
Vertical and horizontal integration of work process	X5 (v30+v32)	3.83	1.36	2-6
Hard control system	v34	1.92	0.85	1-3
Market adjustment and state of competition	X11 (v15+v19)	4.65	1.24	2-6

In addition to the variables/indexes on which the cluster analysis is based, we employed further information at the organisation level to describe each cluster. Examples of such variables include employer, gender distribution, size of workplace (number of employees), proportion of temporary employees, and disposition of work in time and space and access to occupational health services. To compare

the clusters in various aspects, analyses of variances (ANOVAs) and chi-squared tests (in the cases of category variables) were performed.

Results of pattern analysis

Of all the assessed characteristics of organisational change in two years, the most common were structural change to work organisation (60 percent of work sites), change to the production process and technology (38 percent) and increased qualification requirements (56 percent). Other aspects of change were reductions in the size of staff (28 percent), increased use of result monitoring (22 percent), increased vertical and horizontal integration of the work process (15 percent), decrease in the number of hierarchical levels (15 percent), and increased use of soft control systems (14 percent). More changes were identified in work sites in the public sector than in the private sector (Figure 4). This applied to all aspects of the changes assessed.

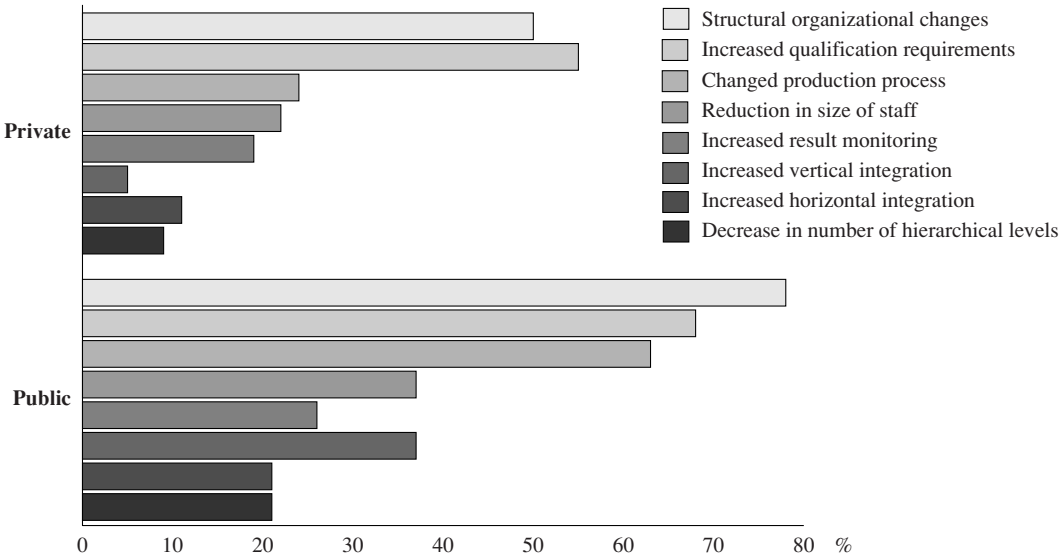

Figure 4. Proportion of work sites (n=72) in the public and private sectors where various aspects of change were identified.

The cluster analysis revealed four patterns of change, each with its own set of characteristics. And there was also a "Stable" group in which virtually no changes had taken place over the specified two-year period. One of the change patterns was characterised by extensive structural change, with increased decentralisation, increased integration of work processes, and increased demands concerning qualifications for employees. This represents an overall process of change in accordance with the concept of lean production. Note that the concept of "leanness" is here regarded as referring to a process, not to a static state.

Other processes of change were named according to their most prominent specific feature: "Standardising", "Market adjusting", and "Centralising". The Market-adjusting pattern is characterised by organisations being continuously adjusted to the needs of customers and demands of the market. But, in these workplaces, major organisational change did not take place during the two-year period.

Table 14 lists the most evident characteristics of each cluster. Further, the five clusters of work sites are compared with regard to changes in staff size. Significantly more of the Lean-production and Centralising work sites were classified as showing reductions in the size of staff over the previous two years than among the other sites.

Table 14. Characteristics of five different patterns of change.

Patterns of change (keywords)	Number of work sites	Most important characteristics
Lean production	11	Extensive structural change
		Increased integration of work processes
		Centralised power structure
		Decrease in number of hierarchical levels
		Increased qualification requirements
		Reductions in staff size (not included in cluster analysis)
Standardising	10	Increased use of result monitoring of standardised elements
		Few/small other changes
Market adjusting	24	High market adjustment and competition
		No other changes
Centralising	7	Centralised power structure
		Increased hierarchical levels
		Increased qualification requirements
		Increased use of result monitoring of standardised elements
		Increased use of soft control systems
		Extensive structural changes
		Reductions in staff size (not included in cluster analysis)
Stable	20	No extensive changes
		Decentralised power structure
		High integration of work process
		Very little result monitoring

Results of comparisons between the clusters in the aspects covered by the cluster analysis itself (means, sd, and results of analyses of variance ANOVA and post hoc analyses) have been presented earlier (Härenstam et al, 2004). The five patterns of organisational changes have also been compared with regard to numeral and functional flexibility, individualisation processes, innovative capacity and social interaction needed for production (table 15). According to these results, although establishments may not implement large organisational changes, it seems as if they use different kinds of management technologies than do most of the changing organisations. The Stable organisations seem to be characterised by a high innovative capacity and they had the most individualised work and were more dependent than others on internal social interaction among the employees. The highest innovative capacity is seen among the Centralising organisations, but at the same time they did not organise work based on social interaction among the employees. Instead, they seem to apply a so-called functional flexibility, i.e. workers are trained to perform many different kinds of job tasks. The Market-

adjusting organisations had the least individualised work and the Standardising organisations had a more extensive use of numeral flexibility.

Table 15. Descriptions of the clusters on indexes not based on indexes or variables included in the cluster analysis. Results of ANOVA analyses. Cells marked with grey deviate most strongly from the others.

Index	Indexes not encompassed by the cluster analysis		**Stable (20)**	**Centra-lising (7)**	**Market-adjusting (24)**	**Standard-ising (10)**	**Lean (11)**	**F**	**p**
X13	Numeral flexibility	**Mean**	5.5	6.42	6.42	7.1	6.18	3.81	.01
		Sd	0.83	0.98	1.38	1.2	0.98		
		Deviation from cluster no	4			1			
X14	Functional flexibility	**Mean**	5.25	6.0	4.62	5.3	5.73	2.79	.03
		Sd	1.02	1.15	1.1	1.57	1.27		
		Deviation from cluster no							
X15	Individualisation	**Mean**	5.5	5.43	4.13	5.20	5.18	4.24	.004
		Sd	1.39	1.27	1.15	1.47	1.33		
		Deviation from cluster no	3		1				
X16	Innovative capacity	**Mean**	9.95	10.71	6.75	8.10	9.27	5.13	.001
		Sd	3.61	1.97	2.02	2.42	3.03		
		Deviation from cluster no	3	3	1, 2				
X24	Production based on internal social interaction	**Mean**	3.65	2.86	2.71	3.20	4.0	2.89	.02
		Sd	1.57	0.90	0.95	1.48	1.0		
		Deviation from cluster no							

Where are the different clusters found?

Table 16 shows differences between the clusters in different aspects not encompassed by the cluster analysis. The results show that there are significant differences between the clusters in a number of respects. These concern employer, type of operation and organisational structures, formalisation, changes of employment conditions, use of part-time contracts, staff reduction, soft control systems, social relations at work, and skills/competencies structure. There are also tendencies for the clusters to differ with regard to access to OHS, number of employees and proportion of temporary employees and position to other companies, i.e. whether the establishment is a part of a larger chain or a contractor.

The cluster named "*Lean production*" mainly comprises large work sites – a hospital clinic, three schools, a large passenger-traffic company, a supermarket, some large industrial production plants, and a company working with IT and computer systems. The cluster called "*Standardising*" contains a food-processing plant, a hotel, some hospital clinics, and also transport and cleaning enterprises. What we call "result monitoring" – the most prominent, and indeed almost the only characteristic of the standardising cluster – was given many names by managers and in the written documentation. Total quality management, bench-

Table 16. Descriptions of the five clusters (percentage within each of the clusters) with regard to organisational characteristics regarding dimensions not considered in cluster formation and results of chi2 analyses. Cells marked in grey deviate most strongly from the others in significant analyses.

		Stable (20)	**Centralising (7)**	**Market-adjusting (24)**	**Standardising (10)**	**Lean (11)**	Chi2	P
Employer							17.6	.03
Public		40	29	4	20	55		
Publicly owned company		10	14	0	10	9		
Private		50	57	96	70	36		
Changed ownership conditions		5	14	17	30	9		ns
Part of larger organisation		70	86	54	80	100		ns
Subcontractor		15	0	58	40	0	19.81	.00
Chain organised		5	14	46	50	9	14.5	.01
Type of operation								
High-tech/IT & knowledge based		21	17	13	0	18	28.6	.01
Human service production		53	33	0	11	36		
Labour intensive service		21	33	87	78	36		
Labour intensive goods		5	17	0	11	9		
Size (>150 employees)		10	43	8	30	36		ns
Staff reduction		10	57	25	30	46	19.7	.01
Staff turnover >15% /year		5	14	21	30	18		ns
Technology-dep. production, large		30	57	42	50	36		ns
IT-dependent production, large		35	29	21	20	27		ns
Formalisation of production, high		0	71	21	20	9	24.3	.00
Soft management technology		45	14	17	10	27	17,4	.01
Group-organised work, extensive		20	0	8	10	27	26.9	.00
Performance-based pay		35	14	33	30	18		ns
Collectively negotiated salaries		25	14	71	50	27	22.5	.00
Access to OHS		65	100	63	90	91	8.1	.09
Proportion temporary employees		5	0	29	50	9	15.1	.06
Proportion women >70%		33	14	17	50	27		ns
Proportion men >70%		30	14	42	20	64		
Gender segregation in workplace,		20	57	52	50	36		ns
Proportion part-time >10%		21	0	38	44	46	19.9	.01
Employees with foreign background		20	14	17	50	18		ns
Age structure, high prop. >45 years		30	43	9	20	36		ns
Extensive in-house training		30	29	8	30	18		ns
No in-house mobility		30	0	50	40	46		ns
Job expansion[13]	Extensive	0	0	0	0	36	28.8	.00
	None	65	43	75	60	18		
Competence structure,	Low <5	45	0	96	80	55	61.9	.00
	High >7	45	43	4	10	36		
Pattern of org str.	Top level oriented	0	71	25	60	25	47.2	.00
	Individual oriented	30	14	21	20	9		
	Public oriented	40	14	0	10	27		
	Market oriented	15	0	54	10	9		

[13] Extensive job expansion meant that employees had got more job tasks, new and more complex job tasks during the last year.

marking, and economic-administrative routines were some of the terms employed in the context of introducing buy-and-sell models into the public sector. The work sites called "*Market adjusting*" were mainly small and medium-sized private sites within the service sector, trade, finance, construction, and transport. Work sites called "*Centralising*" tend to be large, and industrial, juridical or financial companies. The "*Stable*" work sites are mostly medium-sized and large work sites within public administration, schools, and child and elderly care, and also consulting firms within marketing and IT. Both the private and public sector and work sites with gender-mixed, male-dominated and female-dominated staff compositions were represented in all clusters.

Working conditions in establishments with different types of organisational change

In the next step, we investigated working conditions in five different clusters of organisational change. Comparisons between the five clusters were performed by means of analyses of variance (ANOVA) in order to investigate whether it would be worthwhile to perform multivariate analyses. The results are presented elsewhere (Härenstam et al, 2004). Several self-reported and externally assessed working conditions were used in order to explore the associations between pattern of change and working conditions at the individual level.

Significant differences at the 5 percent level (according to analyses of variance) were found in 22 of the 26 tested dimensions. The worst conditions with regard to control, change of influence and development, routine work, ergonomic-physical and occupational hygiene conditions were found in the Market-adjusting organisations. The Standardising organisations had similar work environment problems and also the highest proportion of employees with time-pressure, mental overload, under stimulation and low pay. The best conditions, particularly with regard to extrinsic rewards, control, creativity and ergonomics were found in the Stable organisations. However, good conditions, particularly with regards to occupational hygiene, general work environment and physical strain were found in Centralising organisations, although they also showed the most negative change in development and control possibilities. It should be noted that all employees in these organisations had access to OHS. In the Lean organisations we found the largest increase in control and development possibilities in combination with the most frequent obstacles at work. Furthermore, the most negative change of reward systems and the most frequent worry and conflicts as a consequence of change and high noise levels were also found here. Differences in two of the most important dimensions between the five patterns of organisational change are illustrated in figure 5. The highest proportion in both increased workload and control possibilities were found in Lean organisations.

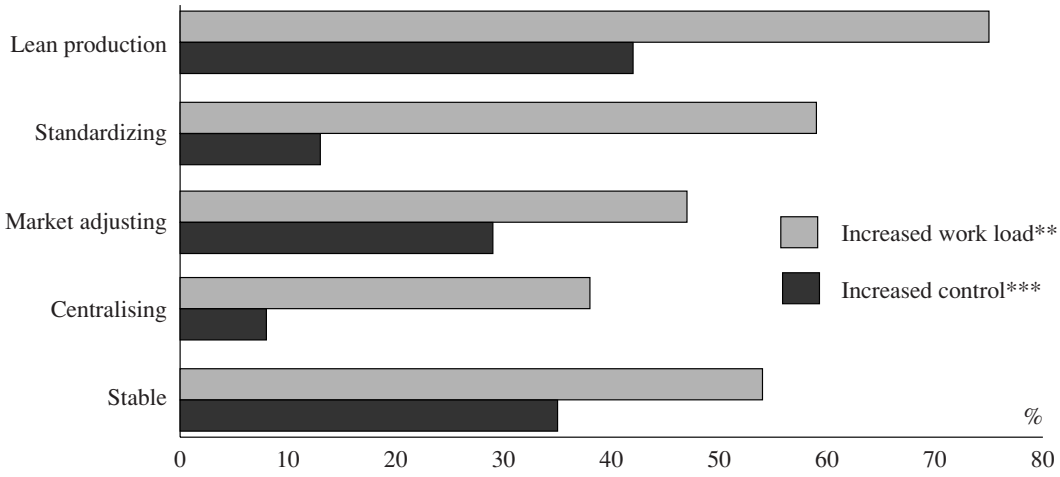

Figure 5. Proportion of the employees in the five clusters, reporting increased demands and control. Chi^2 – analysis *** p: <0.01, ** p>0.05.

Results of multilevel analyses

Multilevel analyses were performed on patterns of organisational change with pattern of organisational change and employer as the explanatory factors at the organisational level. The results are presented elsewhere and summarised here (Härenstam et al, 2000c; 2004). The results show that a relatively large proportion (10-65 percent) of the variance in the various aspects of work conditions could be attributed to the workplace level. The organisational level contributed significantly to the explained variance in 9 out of 10 analyses (all outcomes except circulatory load). The highest proportion of variance was found in ergonomic strain (65 percent), complexity in job tasks (44 percent), workers' control (38 percent) and negative consequences of changes (26 percent).

Thus, it was meaningful to take further steps of multilevel analysis. Both externally assessed and self-rated psychosocial and ergonomic work conditions were affected. With regard to this workplace-level variance, both pattern of change and type of employer (private or public sector) were found to be important in terms of work conditions. To the largest extent, the variance in worry and conflicts, obstacles and changes of influence and development, were explained solely by the employer. Routine work, control and strenuous work postures were primarily explained by the pattern of organisational change and extrinsic rewards were best explained by an interaction of employer and the pattern of change. The impact of change was unequivocally negative, since the workplaces that had not been subject to change showed the best work conditions on all the dimensions assessed.

The results of the multilevel analyses showed that there was an interaction between gender, age, education level, employer and pattern of organisational change. Older workers reported higher demands than younger only in lean organisations. A high level of education meant better working conditions in many aspects, this was however not true in the public sector where the highly educated individuals had higher demands, more obstacles and more physically straining working conditions than the less educated ones. The patterns of change seemed to

affect women and men in different ways. For example, men had the least favourable working conditions regarding control, obstacles and routine work, in the female-dominated public sector. Women reported more worry and conflicts as a consequence of change than men in the Lean organisations that mainly had male-dominated staff.

Discussion

The most prominent finding is that organisational change is extremely common. Over the previous two years 60 percent of the investigated workplaces were subject to major changes to their organisation and production process. The findings of a study performed in the County of Stockholm (Härenstam, 1999d), with a representative sample of several thousand individuals, shows that two-thirds of people in employment had experienced organisational change of some kind during the preceding year. Also, in this study changes are shown to be considerably more common in the public than in the private sector.

Beyond showing that more changes were implemented in the public sector, the results of the multilevel analysis suggest that change had a more negative association with working conditions in the public sector than in its private counterpart. This applied to all indexes describing changed work conditions, and also to control and obstacles. Moreover, the differences between patterns of change were less clear-cut in the public sector than in the private. One explanation for this may be that the principal purpose of changing organisation in the public sector has been either to reduce costs or to subscribe to a prevailing management ideal, i.e. poorly adapted to demands imposed on politically governed operations with diverse goals.

Characteristics of the most common patterns of organisational changes

The findings demonstrate that most workplaces underwent continuous, albeit not so extensive, change on grounds of increased customer orientation and competition on the market (the Market-adjusting pattern of change). This kind of change was especially common in relatively small work places in the commercial, service, transport and construction sectors. This is in line with a French survey of organisational changes. They concluded that after the recession in 1993, there was an increase in change strategies based on internal and external transactions, aiming at quicker response to market demands. Before the recession, change strategies were more often directed at quality issues (Greenan & Mairesse, 2003).

The next most common pattern consisted of what is called Lean organisation. Thus, the results provide support for the view of transition to lean production becoming common in recent years, in both the private and public sector. Another identified pattern was denoted as “Centralising”. Above all, this is characterised by the introduction of more decision levels and increased centralised control, i.e. by changes contrary to the recent trend towards flatter organisations. The level of functional flexibility was highest in comparison to the other clusters of organisations, i.e. more job tasks and more responsibilities were given to the workers, albeit not more influence. Other studies have also observed that in new organisa-

tional practices, an increased number of hierarchical levels seem to follow with decentralisation of responsibilities to bottom-line workers (Greenan & Mairesse, 2003, Thompson & McHugh, 2002, p. 189).

A fourth pattern was also detected – what we call "Standardising". Here, the only clear change was that there had been an increase in measurement and control of employees' performance and productivity. This type of change was also apparent in both the private and public sectors, and within several industrial and commercial types of operations. In the Lean organisations, the Centralising and the Standardising organisations, power structure tended to become more centralised. Yet another observation was that in both Lean and Centralising organisations, there had been a major reduction in staffing. This finding serves as a reminder of downsizing not being equivalent to the introduction of lean production.

The interdependency to other organisations seems to be associated with change strategy. None of the Centralising or the Lean organising establishments was a subcontractor to other companies. All the Lean organisations and all but one of the Centralising organisations were instead part of a larger company. Perhaps their change strategy – centralisation of power or introducing the lean concept – is an outcome of an orientation towards the "mother" company, rather than towards their commissioners, competitors, customers or employees. To standardise production and continuously adjust to the market, were the most common change strategies among subcontractors and chain-organised companies in the labour-intensive service sector. These organisations were also the ones that mainly employed less educated workers. Thus, it seems as if different types of organisational change are directed at specific segments of the labour market and that this, to a large extent, coincides with what kind of individuals they primarily employ. This is in line with the two-sided Human Resource Management according to Legge (1995), with the "hard side" directed at the easily exchangeable workers and the soft side at the "core" workers.

Organisational impact on working conditions

Results of the multilevel analyses show that a significant and large proportion of the variance in nine out of the ten aspects of work conditions that were tested is attributed to the organisational level. The highest proportion of variance was found in ergonomic strain, complexity in job tasks, workers' control, and negative consequences of changes. Notable is that among all variables tested, the variance of externally assessed strenuous work postures is found, to a higher degree than the other variables, at the organisational level, and it is particularly explained by patterns of change. Similar results were seen regarding routine work, another externally assessed variable. It is reasonable to believe that the variance is to be explained less by individual related factors when experts perform the assessment.

The impact of change was unequivocally negative, since the workplaces that had not been subject to change showed the best work conditions on all the dimensions assessed. The Standardising and Market-adjusting patterns of change had deleterious effects, whereas the Lean and Centralising patterns led to dual out-

comes. Organisational change was perceived as having more negative consequences in the public sector than in the private sector. In workplaces where result measurement and monitoring were increased (the Standardising pattern), and in those which are most exposed to competition (the Market-adjusting pattern), the level of control of employees was lowest. Strenuous work postures and routine work, which were externally assessed, were found to be most common in Market-adjusting workplaces. Perhaps the job intensity does not permit the worker to choose less strenuous work postures or to take breaks when needed.

Impact of organisational changes for different groups of the work force
The results of the multilevel analyses show that there is an interaction between gender, age, education level, employer and pattern of organisational change. Changes characterised by result measurement and monitoring (the Standardising organisations) are most common in organisations with a large proportion of female staff and many temporary employees. By contrast, men in permanent employment, largely dominate work organisations where lean production had been implemented, i.e. ones that utilised both the carrot and the stick. Moreover, inter-cluster comparisons over aspects not involved in the cluster-generation itself show that the clusters differed substantially with regard to staffing structure. This strengthens the supposition that different types of strategies for change are employed according to the part of the labour force at which they are addressed. Changes to forms of employment constitute part of such strategies. This is in line with other research that has identified increased differentiation in working conditions as a consequence of new management trends (Altman & Deiβ, 1998; Dore, 1997). As different types of changes congregate in specific areas of the labour market and affect groups of employees in different ways, the results indicate that organisational change contributes to increased differentiation of working conditions.

Important issues for future research are to investigate not only effects of certain organisational changes on working conditions but also the contexts in which different patterns of change are introduced, and how such introduction contributes to or acts against polarisation of the labour force.

Methodological considerations

Assessment methods
The empirical analyses of organisations in the MOA-study indicate results that are possible to generalise to Swedish working life in the mid- and late 1990's. The assessments of organisational aspects in the MOA-study are based on an empirical material that was collected by means of structured interviews with managers, sometimes with more than one key informant at the workplace. The interviews were supplemented by documents and by the researchers' observations during the whole study period at each work place (1-3 months).

Several strategies were used in order to test the reliability and validity of the assessments of organisational structures and organisational changes that were used

in the two separate cluster analyses. According to post hoc and discriminatory analyses, the interpretability of the results, the differences between the clusters including dimensions not included in the cluster analysis, and associations with working conditions found in uni-variate and multi-level analyses, all indicate that the assessments of organisational structures and changes, which the cluster analyses were based on, have satisfactory reliability and validity and ought to be fruitfully used in further studies of organisations and working conditions.

It should be mentioned that we aimed at an assessment method on organisational aspects for work and health studies, applicable in large samples of a broad variety of organisations in several industrial sectors. This means that the issue of choosing aspects to be covered also had to be broad and defined in a way that was possible to use in many different kinds of organisations. It also meant that they could not be assessed in detail in many of the dimensions. In samples of work sites within one industrial sector, more specific organisational aspects should be chosen, relevant for the studied sector and for the possibility of differentiating between establishments.

Validity and interpretation of the results

The results of working conditions at the individual level cannot be generalised to the whole Swedish working population. It is a cross-sectional study, and the sample of individuals is small and not random (since the aims were to match women and men, and cover a wide variety of organisations and types of work). On the other hand, the range of workplaces is fairly extensive in the context of this kind of study – one which despite drawbacks enables us to compare various kinds of organisations. As qualitative analyses were performed, this also strengthened the validity of the results of quantitative results (Creswell, 2003, p. 221). These results led towards the same direction and we obtained a deeper knowledge, thus facilitating interpretation.

Due to the number of dependent measures used in uni-variate analyses (in tables 5, 6, 9, and 15), our use of separate ANOVAs risked inflated Type I error. Applying the Bonferroni correction to the omnibus test of significance would lower the p value for each ANOVA. However, as all differences were in the same predicted direction, the overall pattern of the data is consistent with our general hypothesis. Furthermore, the purpose with the uni-variate analyses was not testing hypotheses. Instead, ANOVA was used as a validation of the clusters of organisations found (see table 5, 6 and 15) or as a guiding exploration whether or not multilevel analyses would be worthwhile to undertake (in table 9). The conclusions drawn on differences between organisations and working conditions are based on cluster analyses and multilevel analyses.

The quantitative variable-oriented analyses, the pattern analyses and the multilevel analyses supplement each other and the results go in the same direction. The multilevel analyses contribute with more reliable results as the variance is partitioned between the organisational level and individual level, and cross-level interactions can be calculated. Qualitative data analyses contribute to a deeper understanding of phenomena and of associations shown in the quantitative analyses and

are meant to increase the interpretability and validity of the results (Creswell, 2003, p. 221). The mixed method approach was valuable in the light of the exploratory purpose of the study (see, Creswell, 2003, p. 215). A mixed method approach has been suggested as appropriate when testing elements in an emerging theory and when constructing new assessment methods (Creswell, 2003, p. 215-216). We have applied both the so called sequential exploratory strategy (ibid p. 216) and concurrent triangulation strategy (ibid p. 218).

Conclusions on development of methods

The exploratory MOA-study was intended to contribute primarily to knowledge about *what* aspects should be assessed, *how* they can be *defined, operationalised and assessed* and how they can be *analysed* in relation to data at the individual level. On account of the limited number of individuals, variation in health was not expected to be sufficiently large to be used for outcomes in statistical analyses. Instead, aspects of working conditions that earlier research had shown to be important for health were chosen as outcomes in relation to organisational aspects. The sampling and study design, its exploratory nature, the use of intensive studies of a broad range of organisations and working conditions, have *identified important methodological problems* that we recommend be taken into account in empirical studies. These issues are commented upon below.

What to assess

When searching for patterns of *organisational structures*, we found that the most common pattern is characterised by *centralised power structure*, a high degree of *formalisation*, extensive use of *result measurement*, and a *fragmented work process*. Twenty-three of the 81 establishments belonged to this cluster, labelled Top-level oriented organisations. This is an interesting observation. It is not in line with contemporary management rhetoric with its emphasis on decentralisation, high integration, learning organisations, and individualisation (Womack et al, 1990). However, critical management studies have described the tendency of a centralised power structure, with increased use of *"hard" management technologies"* (Legge, 1995). We experienced that some traditional organisational dimensions, particularly "span of control", could not be assessed and used as an indicator of centralisation. Modern organisations are seldom organised in a strict hierarchical order. It is common that employees have many superiors, functionally rather than hierarchically ordered, particularly in matrix and project organisations. We defined hierarchical levels when they were in place. But it meant that when several parallel managerial levels were found, they were defined as only one level in the hierarchy. Instead of strict criteria for centralisation (such as calculating span of control and number of hierarchical levels), we relied on information from the interviews with managers (with the support of documents). When questioning on the execution of power, we asked for examples on sources of decisions (such

as the executive board, different levels and functions of management, owners, political representatives), how decisions were implemented and the impact on daily operations as well as from a long-term perspective. Sometimes it was difficult to decide whether "*centralised power*" should be categorised as "high", "medium" or "low". As we developed our argument about how to assess levels of centralisation, this might have influenced our findings of associations with working conditions. This is in contrast to what might have been found out using more traditional definitions. We concluded that traditional structural organisational aspects (such as hierarchy, formalisation and integration/fragmentation of the work process) were of less importance, particularly when studied as separate dimensions, than, for example, *management technologies*. Hard and soft management technologies were both of great importance in relation to working conditions. We discovered that *result measurement* (hard technologies) is quite easy to assess even if managers labelled them in different ways. The most common pattern of organisations had the most extensive use of hard technologies. Thus, it seems important, and also possible to assess result monitoring in future studies. Finally, *characteristics of the production process* such as whether or not it was *based on social interactions* seem to have great impact on working conditions. Also *technology and knowledge dependency* in the production process were highly correlated with working conditions and differentiated between the clusters of organisational structures.

Furthermore, *type of operations* and *work object* were identified as having great significance for working conditions. This was observed early on in the qualitative analyses of interviews with employees. When tested in statistical analyses, applying a modified version of Giertz's types of operations (2000), as well as defining jobs by type of work object (by applying a modified version of Kohn & Schooler, 1983), we found clear differences between these types respectively (Härenstam et al, 2000a, Härenstam & the MOA Research Group, 2005).

Results of identification of *patterns of changes* show that the most frequent pattern is characterised by continuous adjustments to the market. The Market-adjusting organisations are mainly characterised by acting in a highly competitive market and continuous, albeit small, adaptations of the organisation and staff were in place. The second most frequent pattern were organisations that had not implemented any major changes during the last two years (the Stable ones). Lean organisations were also found, a pattern that has been recognised in earlier research. *Increased result measurement of standardised elements and procedures* was the only characteristic of the "Standardising" pattern. Both *changes to soft and hard technologies* were highly correlated with several aspects of working conditions. These dimensions seem worthwhile assessing in forthcoming studies of organisational level's impact on working conditions. The *extent of changes in the organisations* is the most important aspect identified in both the qualitative and quantitative analyses. This aspect should be worthwhile developing further in future studies by exploring *frequency of changes*, *incentives for change* and *implementation methods* used for organisational changes.

Some management technologies, such as *flexibilisation* were assessed and identified as to a large extent associated with a number of aspects of working conditions. *Flexibilisation strategies* (numeral and functional) and *innovative capacity* differentiated between the clusters of organisational changes. These concepts are quite new in organisation research, but our observations indicate the great importance of these aspects and they should be conceptually developed and better operationalised in order to further explore their impact on working conditions in future studies.

How to define, operationalise and assess

The chosen methodology for assessment of organisational aspects, i.e. interviewing managers and collecting documents, worked out well. The exploratory approach and the qualitative analyses of interviews were very time-consuming and are not recommended as a main approach in future studies. The aim of the MOA-study was to develop more effective assessment methods, such as structured interviews with well-defined criteria for each aspect and value level.[14] We conclude that structured interviews can be recommended for future studies. Questionnaires for assessment of organisational characteristics would probably not give valid assessments of organisational aspects, at least not in studies of a broad range of organisations. The words used for different organisational aspects seem to have different meanings in different types of operations and industrial sectors and thus have to be explained in a dialogue. In some aspects, such as centralisation, it was very difficult to "transfer" the traditional meaning of a theoretical construct. The difficulties can either be a matter of theory, for example, if power is not executed by hierarchical subordination but by internalisation of the organisational goals and loyalty to the company as suggested in critical management theories (Rose, 1999; Thompson & McHugh, 2002, p. 165, 192), or an empirical issue, such as difficulties in defining levels of management in non-hierarchical organisations. This problem will be further investigated in the Healthy Work Place Study and in a follow-up case study "Where is the power over working conditions found?"[15]

In most aspects, the assessment was categorised by three different labels. This is a rather "rough" categorisation, but it was perceived as empirically feasible in a study sample as ours with a broad variety of organisations. In a more homogenous sample of organisations, a broader range of value labels might be needed in order to differentiate between organisations.

Studying changes in organisations and work places has several methodological implications. First, when studying change, the time perspective has to be dealt with. In most quantitative occupational health studies of change at work, the conditions at different times are studied and the differences between two or more

[14] A structured interview instrument has been further developed and applied in the Healthy Work Place study and is presented in a forthcoming report (Härenstam et al, manuscript).

[15] Swedish council for working life and social research, grant nr 2002-0316.

exposure measurements are related to health outcomes. The underlying hypothesis is that exposures at a certain point in time or period are important for health. An alternative strategy to such a "static" view is to focus on processes and mechanisms involved in the interplay between organisational changes and health consequences (Johnson & Hall, 1996). Organising, job content and the demands of the job as well as the resources and expectations of the employee can be described as processes. Thus, the "exposures" can be regarded as continuously changing conditions with complex interactions that might have an impact on health. One strategy is to focus on change as such, either by asking the respondents about their experience of change, or by looking at fluctuations over time. In the MOA-study, changes over time could not be assessed. Instead, we asked the managers to describe what changes had occurred. We think that the validity is satisfactory as we also asked them to give specific examples of what had changed, and where in the organisations changes were implemented and who were affected. This information was used when determining the value labels for items on organisational changes.

Categorisation of organisational changes was easier than in the case of assessing states of organisational characteristics, at least when choosing between the categories increased, unchanged and decreased. The assignment of categories in these cases was relative over our whole sample. This might be problematic in other, more homogeneous samples. Another study on organisational changes also found that managers could more easily respond to questions on change as compared to questions on "state" (Greenan & Mairesse, 2003).

How to analyse

Pattern analysis is a method suitable for identification of groups of individuals and/or work places with similar conditions (such as organisational changes). Effects on working conditions and health from different patterns of changes can then be analysed by comparative analyses (Bergman et al, 2003, Härenstam et al, 2003). We assumed that separate dimensions do not themselves influence the working conditions. Instead, we suggested that complex patterns and interactions between several organisational characteristics were associated with working conditions at the individual level. This strategy is similar to the one applied in a French study of organisational changes where correspondence analysis was applied to synthesise information (Greenan & Mairesse, 2003). They conclude that new organisational practices tend to cluster and cannot be described by any primary variable.

The present study aimed at exploring whether new patterns of organisational structures and changes could be found in Sweden during the mid 1990's. By applying the cluster technique, five patterns of organisational structures as well as five patterns of organisational changes were identified, reflecting both well-known and new patterns of organisational structures and organisational changes. Still, we do not know if these patterns are stable over time or if other patterns will turn up in forthcoming studies. This is an important issue for future research.

It should be noted that the cluster technique applied in the MOA-study was not intended for identification of patterns of stable organisational structures over time. Instead, if working life is continuously changing, new patterns should be expected in studies using the same methodology on other data. This means that in order to develop a theoretical understanding of how work is organised and changing in contemporary working life, several empirical studies have to be performed and the results interpreted in relation to earlier theories.

The other strategy, also illustrated in this report, was to use multilevel analysis (Bliese & Jex, 1999; Bryk & Raudenbush, 1992; Cogliser & Schriesheim, 2000). This methodology has been shown to have two main advantages. One is the ability to differentiate the total variance in working conditions and work related health that can be attributed to organisational factors and individual factors, respectively. The empirical results from the MOA-study show that organisational conditions do play an important role. This is in line with some earlier research that has utilised multilevel analysis (Bliese & Castro, 2000; Jonge et al, 1999; van Yperen & Snijders, 2000). The second and equally important conclusion from the application of multilevel analysis is the fact that interactions between levels in a hierarchy (such as organisational factors and individual factors) can be explored. This refers to those specific organisational conditions that may affect how individual characteristics influence working conditions or health. As reported earlier, there are several indications of the same type of change at the work place level having different consequences at the individual level. Thus, results on how organisational structures affect workers cannot be generalised to all groups of workers. This is an important observation that should be taken into account in a theoretical understanding of the linkage between organisations and individuals.

In the present study, the same multilevel models were applied across a wide range of working conditions. We may reasonably assume that different aspects at the organisational level affect strenuous work postures, demands, control and support in different ways. More of the variance could probably have been explained if the independent variables had been chosen as the most relevant ones in relation to each of the specific working conditions under study. On the other hand, if the same organisational factors affect a number of different outcomes this is important information about factors that should be focused on for intervention and prevention.

The sampling procedure is crucial for the possibility to interpret the results of multilevel analyses. The design of the MOA-study follows the recommendations for multilevel analysis by Kalleberg (1994), i.e. selecting organisations in the first step and individuals in the second. Our conclusion is that this sampling strategy can be recommended when the research questions concern the understanding of the organisational significance for workers and mechanisms within organisations. However, this strategy is not suitable when exploring selection of individuals across certain types of organisations and working conditions. In such cases, representative samples of individuals should be the first step, and then add the work places where the persons studied work (Kalleberg, 1994).

Contribution to hypothesis development

The exploratory nature and the qualitative and quantitative methods used contribute to *hypothesis development* on the organisational impact on individuals. The MOA-study design and sample size were not aimed at testing hypotheses. But the empirical evidence helps to identify research questions that can be investigated in future studies. Some specific research questions are important to investigate in forthcoming studies as they seem to illustrate the significance of organisation for working conditions: "*stakeholder orientation", "type of production and work objects", "organisational changes", "centralisation and responsibilisation", and "distribution of risks and inequalities in working conditions".* It is beyond the scope of the study's aim to achieve an understanding of *why* work is organised and changed as it is. Nevertheless, in order to understand the mechanisms between organisations and individuals, and as organisations are not isolated entities, we have touched on issues that relate to the link between organisations and their environment. Several of the issues that seem important to explore in future research concern this link which means that intra-organisational aspects are not sufficient when trying to explain the organisational impact on working conditions. This observation would appear to be tangential to theories on organisations as open systems (see e.g. Thompson & McHugh, 2002, p. 54-69).

Organisational structures and organisational changes were separately analysed in the MOA-study, both in cluster analyses and multilevel analyses. The two different ways of categorising organisations did not coincide and both ways of categorising differentiated between working conditions (see Tables 7 and 15). As our approach was to classify organisational structures and changes separately, it thus also appears to be worthwhile pursuing in forthcoming studies, but the mechanisms have to be better understood and theoretically developed.

Stakeholder orientation

A couple of the patterns found in the cluster analyses of organisational structures and changes seemed to coincide to a large degree with type of operation but other patterns were common in many types. The cluster analysis of organisational structures identified five patterns that were named by stakeholder orientation, as they seemed to orient themselves towards different actors within and outside the organisation. Notable is that none of the Stable organisations were found in the Top-level oriented cluster. Instead, the Stable organisations were oriented towards citizens (the Public oriented) or the core employees (the Individual oriented). Perhaps organisational changes are avoided so as not to disturb operations when one has to adjust to "down-stream" interest groups. The Top-level oriented organisations had implemented more changes (in number of aspects) and the changes to the production process and work organisation had been more extensive than in the other types of organisations (Table 6). When power is executed by a "remote control" strategy, as indicated in the Top-level oriented establishments, managers may have less interest in the possible consequences of their decisions

concerning the bottom-line production staff. Instead, they may be more interested in satisfying the owners and of having a reputation of being a "modern" organisation by showing action through frequent changes and applying "new" management technologies. Another explanation might be that they, as part of a larger organisation, had to implement changes even if their own production did not motivate such a change, but rather to achieve a greater similarity with other organisations in the whole corporation. Imitation and adaption to what is regarded as the main trend in organising has been suggested as a main driving force for organisational change (see for example Sevón, 1996, p. 49-67; Sahlin-Andersson, 1996, p. 69-92). If our indications of stakeholder orientation as an important explanation as to why organisations are structured as they are hold in future research, it could be hypothesised that imitation and adaption is more important in large hierarchical organisations, where power is centralised and where other stakeholders, such as the employees or the customers, have less power. Our observations on the environmental impact on organisational structure have many similarities with resource dependency theory. One important researcher in that field wrote: "Organisations tend to comply with the demands of those interests in their environment which have relatively more power" (Pfeffer, 1997, p. 63). Resource dependency theory is one model within a larger theoretical concept of organisations as open systems (see for example Thompson & McHugh, 2002). Resource dependency theory focuses on power relations. In this research tradition, the interest is in power relations and dependency both within organisations, for example, between sub-units, as well as to the surrounding environment.

> "Outside the organization, dependency is conditioned by the fact that the environment is a source of scarce resources that have to be competed for. Dependency is the reverse of power" (Thompson & McHugh, 2002, p. 57).

Contingency theory is another so called open system theory. Predictability and stability in the environmental settings were regarded by some researchers in that tradition as important factors for how work was structured within the organisation (Burns & Stalker 1961, p. 83). One difference between our perspective and contingency theory is that our observations seem not to be explained to any large extent by a functional fit between the environment and the internal organisational structures. Furthermore, contingency theory seems to regard the managers as having the power over organisational structures. To successfully form the organisational structure, they should acknowledge and interpret the environment correctly. Our hypothesis on stakeholder orientation as a contributing factor to how organisations are structured implies that managers at the establishment level have little influence over organisational structures in those types of organisations where the most frequent and extensive changes are implemented. Other researchers have noticed managers' restricted power:

> "managers are working within short-termist, cost-cutting rules set by the dominant corporate coalition" (Thompson & McHugh, 2002, p. 121).

In conclusion, our observations of the importance of taking stakeholders' power into account imply that not only are organisational structures influenced by power relations and dependencies to actors within and outside the organisation, but also the extent and type of organisational changes that are implemented.

Type of production and work objects

The results of the different analyses suggest that organisational structures and strategies as well as working conditions are strongly adjusted to type of operations (see Giertz, 2000) and work objects (see Kohn & Schooler, 1983). In classic organisational literature, this is often viewed as the technology of an organisation pertaining to the questions of technological complexity (discussed by Thompson & MacHugh, 2002, p. 60) and how inputs are transformed into outputs (Scott, 1998). The importance of technology for organisational structure has primarily been concerned with questions regarding span of control, the subordinate-supervisor ratio and workflow integration (Woodward, 1958; Pugh, 1973). The Aston Group discovered that other contextual factors, such as size and interdependence with other organisations had greater impact on the organisational structure than had technology (Pugh, 1973). In our analyses, we investigated the most important resources for core production and we categorised the resources as social interaction, knowledge and high technology. The organisational structures, management technologies and organisational changes as well as working conditions differed depending on what type of resource was utilised. This observation is well known in traditional organisational theories (see Leavitt 1965, p. 1148-1151), but should be further conceptualised and applied in forthcoming studies of organisational impact on working conditions. We need to know the main characteristics and regularities *within* types of operations and how they are linked to working conditions. It is of importance for the promotion of healthy work to attain knowledge of the degrees of freedom for managers to choose organisational design as well as knowledge about restrictions when type of operations and work objects are fixed. And there is a need to know the variation in organisational structures and management technologies *between* different types of operations in order to develop knowledge about how healthy working conditions can be accomplished in all types of organisations. A generalised knowledge is particularly important for a theory of the organisational significance for working conditions and health in contemporary working life as the types of operations and work objects differ from what was the case in a traditional industrial labour market.

Organisational changes

The present study has demonstrated how the organisational structure and changes indicate different organisational practices that theoretically should have different impacts on working conditions. Significant organisational impact on job demands was only found when organisational structures were investigated. But the variance was significantly explained by organisational changes in more aspects of working

conditions compared to the variance explained by organisational structures. According to the results of multilevel analyses, some groups appeared to be particularly vulnerable to the negative impact of certain types of organisational change. It was found, for example, that the gender in minority had less development possibilities and more negative consequences of organisational changes: women in the male-dominated Lean organisations and men in the female-dominated organisations in the public sector. In general, women reported less worry and conflict as a result of organisational change than men did. In Lean and Market-adjusting organisations, however, we found the opposite pattern: women reported more negative consequences than men did. As expected, employees with higher education in general had better working conditions than those with less education, regardless of the type of organisational change. In the public sector, however, a different pattern emerged. According to our results, it seems that the more highly educated were the "losers" in the restructuring of the public sector in Sweden during the 1990s. Furthermore, we found significant cross-level interaction between age and two of the change patterns: organisational changes as those implemented in Lean and Centralising establishments, were worse for older workers than other types of changes with regards to job demands. Both these types meant job expansion and downsizing. Thus, organisational changes seem to have different impact on different workers and that some are "losers" while others are "winners". Organisational changes seem to distribute risks and possibilities among the work force. The question of how these processes develop over time is an important field that should be explored in further research.

The mechanisms in the local work place that link specific organisational changes to working conditions have to be further explored, for example, by case-studies, particularly for the understanding of the implications of organisational changes. What is the significance of *how* organisational changes are implemented? What strategies for coping with changes are used by managers at different levels, by work groups and by individuals? What scope of action is in place that can adjust organisational changes initiated from above to fit local conditions and individual differences in capacity, attitudes, and experience of changes? What kind of resources and support are needed in order to counteract negative consequences of changes? These issues are explored in the Healthy Work Place Study.

It should be noted that our focus is organisational change, i.e. implemented from a managerial or business perspective. Knowledge on change processes implemented with an outspoken purpose to improve work environment or from the workers initiative is also important, particularly for knowledge about intervention, but beyond our objectives here.

Centralisation and responsibilisation

One trend in contemporary working life seems to be the centralisation of power, sometimes accompanied by the levelling out of hierarchies (Larsson, 2000; Szulkin, 1999; Thompson & McHugh, 2002, p. 118). The new ways of executing

top-level power have been described as increased remote control, self-governance and internalisation of goals (Garsten & Jacobsson, 2004; Rose, 1999). Thompson and McHugh write

> "the most significant challenge to established labour process frameworks, comes from the argument that the locus of control has shifted from external to internal" (2002, p. 114).

In popular management literature, increased responsibilities are often described in terms of empowerment, presented to employees as them being more involved in decision-making (discussed in Thompson & McHugh, 2002, p. 117). Centralising authority over strategic decisions seems to go along with decentralisation of responsibility for job performance and results (Garsten & Jacobsson, 2004). For example, strategic operational decisions are being made at an increasingly greater distance from the place where the job is being done (Larsson, 2000). In the 1990's, new information technology systems have made it possible to monitor and manage activities at the workplace level from a distance (Allvin & Aronsson, 2001). Furthermore, getting employees to think and act like managers and thus be self-governed by internalising shared values and goals has been widely discussed in recent organisation research (Garsten, 2004).

> "Delegated responsibilities [...] mean that employees have to develop their own disciplinary 'rules', thus collaborating with management to identify and reward the 'good worker'" (Thompson & McHugh, 2002, p. 114).

In the MOA-study, we found that Top-level oriented organisation was the most common pattern of organisational structures and that employees in these establishments were given more job tasks and increased responsibility in comparison to the employees in the other clusters. The Top-level oriented organisations mainly consisted of service production. Bureaucratisation of service work has been noticed in earlier research. Thompson and McHugh (2002, p. 186-189) write that bureaucratic organisational design has not come to an end even if the rhetoric in management seem to send such a message. Instead, organisational change is often in a direction of implementing more rules, hierarchy and centralised power. Again, it is worth mentioning that the increased responsibilisation and job expansion found in our study did not result in increased control for the workers, instead we discovered the opposite to be true. Externally assessed working conditions in job situations according to the Job demand-control model, assessed by questionnaires (Karasek & Theorell, 1990), were explored in the same study group (Waldenström & Härenstam, manuscript). In this study women in so called active job situations had less control than expected and the most organisational obstacles were found among these women (such as lack of resources that they did not have the authority to change). Or so it seemed, as there was confusion between what the workers meant by having control and having responsibility for job performance and results. Contrary to what is proposed by the model, this might explain why women in active jobs as shown in some studies have increased risks of ill health (Vathera et al, 1996; Krantz & Östergren, 2002).

When investigating organisational changes in the qualitative analysis of interviews with workers, we found that increased job intensity combined with result monitoring had also meant less time for reflection and exchange of experiences both between colleagues and supervisors, and between the production level and strategic decision-making level (Härenstam et al, 1999a). It could be hypothesised that increased centralisation of strategic decisions along with increased decentralisation of responsibility for job performance, will lead to increased job intensity and decreased control for the workers, particularly if workers have little support from superiors to prioritise between job tasks and limit work assignments. Or, can managerial control from corporations, owners and political assemblies increase and, at the same time, produce increased control over and within work for the employees as empowerment approaches suggest according to popular management rhetoric (see Thompson & McHugh, 2002)? This issue is now investigated in another follow-up study (Where can the power over working conditions be found?[16]).

Distribution of risks and increased inequality

Who is doing what in working life has always been a strategic issue for managers, unions and occupational health practices. For management, recruitment is fundamental when trying to control costs, increase stability and minimise risks (Thompson & McHugh, 2002:66). The results from the MOA-study indicate that this issue is very important today. The American sociologists, Charles and Chris Tilly, are attempting to answer why and how work is changing and why there is a tendency towards differences between jobs and inequalities in working conditions (Tilly & Tilly, 1998). They focus on the interaction between different levels of organisations and actors and have described the main work mechanisms in a theory of how work is organised (Tilly & Tilly, 1998). These mechanisms are: incentives, embeddedness, contracting, autonomy, matching, mobility and training. Incentives include negative as well as positive structures of rewards at work, while embeddedness concerns how work is affected by the degree of integration of the product or the recipients of service. Contracting reflects differences in terms of the degree to which work is contracted out in different forms. Autonomy refers to the relative degree of control of the work process by the employer and the employee. Matching covers the degree to which work is organised in dependent networks or based on professional merits of different kinds. Mobility concerns promotion and turnover of employees. Training includes formal education as well as on the job training and apprenticeship. The results of the MOA-study, lend supporting evidence to the importance of these mechanisms. The patterns of organisations differed in the prevalence of in-house mobility and competence structure. And certain groups such as women in male-dominated establishments did not benefit as the men did in increased control and development possibilities resulting from organisational change. Establishments with the

[16] Swedish council for working life and social research, grant nr 2002-0316.

worst working conditions primarily employed less educated persons and temporary job contracts were over-represented. A change pattern characterised soley by standardisation and result monitoring was most common in organisations with a large proportion of female staff and many temporary employees. This is in line with earlier research. The worst aspects of flexibilisation are found at the periphery, especially among women and minority workers according to Mitter (1986, p. 139). On the other hand, establishments with the best working conditions primarily employed groups with a strong position in the labour market (Härenstam & MOA Research Group, 2005). Workplaces where the lean concept was employed, i.e. ones that used both the carrot and the stick, mostly employed men on a permanent basis. This indicates that implementing different organisational change strategies may increase differences in work conditions between different groups of the labor force. This strengthens the supposition that different strategies for change are employed according to the part of the labour force that they address, and that changes to forms of employment constitute part of such strategies (Quinlan et al, 2001).

Several researchers have drawn attention to the significant transfer of risks and problems regarding work and employment conditions that have taken place from the center to the periphery of the labour market (Aronsson, 1999; Beck, 1992; Castells, 2000; Larsson, 2000; Sjöstrand, 1999). It has been suggested that new management technologies and extensive, frequent re-structuring of organisations in contemporary working life act as distributors of risks (Child & McGrath, 2001; Gil, 2001). According to Pollert (1988), "flexibility analyses largely set aside the issues of gender and ethnicity by recasting dual labour market as benign, progressive or inevitable". Thompson and McHugh (2002, p. 176) wrote that flexibilisation is a matter of avoiding legislation that protects employee rights. Other studies have shown that differences exist between establishments with core activities and outsourced service activities, and between growth industries and downsizing industries (Dhondt et al, 2000; Purcell & Purcell, 1998). Transfer of risks and problems occurring between corporations and subcontractors and between stockholders, strategic senior management, operational managers and individual employees have been discussed (Ahrne & Hedström, 1999; European Foundation, 2002). Thompson and McHugh (2002, p. 176) argue that this is not primarily a core-periphery issue but a consequence of the need to reduce costs. Nevertheless, the effect as has been proposed by Quinlan and colleagues (2001) is increased differences and inequalities between different groups and the distribution of insecure and health hazardous jobs to more vulnerable groups. The results from different analyses from the MOA-study support such a hypothesis. The position in a production chain (such as being a core company or a contractor) impacted on how work was organised (for example by flexibility strategy) which, in turn, affected working conditions (Härenstam & the MOA Research Group, 2005), and vulnerable groups (such as the gender in minority) experienced more negative consequences of organisational change than other groups (Härenstam et al, 2004).

However, the mechanisms in local work places must be better understood. One important mechanism is that less-qualified jobs are often found in labour-intensive operations. Therefore, if there is a demand for reducing costs, the main effect of layoffs and decreased investments in development in such industries is that of less educated workers being exposed to negative changes. An important question for future studies concerns the contexts in which different organisational change strategies are applied, and how different strategies contribute to or act against polarisation of the labour force and a sustainable working life.

Summary and concluding comments

In the beginning of the present report, some questions were raised. The answers to these questions are summarized below.

1) What organisational aspects should be studied?
In earlier organisational theory and empirical studies, intra-organisational conditions, mainly with regard to hierarchy, integration/fragmentation of the work process, formalisation and technology have been explored in relation to working conditions (see a forthcoming report on theoretical background, Härenstam et al, manuscript). According to the results of the qualitative and quantitative analyses in the MOA-study, the following aspects seem important and we recommend that they are explored in forthcoming studies of organisational level's impact on working conditions.

1. What is produced (type of operations and work objects).
2. Social interaction, technology and knowledge needed for the production process.
3. Position in the production chain.
4. Relations to owners, corporations, competitors, contractors, and customers.
5. Innovativity.
6. Access to resources, leanness.
7. Standardisation.
8. Staffing structure and policy; who is employed and under what conditions?
9. Flexibilisation strategies.
10. Hard and soft management technologies.
11. Organisational changes (type, extent, frequency, implementation and motive for change).

Several of the identified aspects could be classified as "contextual" or "functional" in relation to the production process (nr 1-3). Others could be classified as business strategies or "positional" in relation to competitors and stakeholders (nr 4-6). A third group describes management technologies and staff policies and can be defined as "intra-organisational" structures and strategies (nr 7-10). Finally, organisational change was identified as a very important aspect in relation to working conditions.

We conclude that the organisational impact on working conditions needs to take contextual factors into account in order to understand the link between organisation and individual. Our observations indicate that inter-organisational factors, such as an establishment's relative position in a production chain and its market position, as well as inter-organisational relations and customer relations, seem to be important.

2) How can relevant organisational aspects be defined, operationalised, and assessed?

In the present study, definitions of relevant organisational aspects were stipulated after qualitative analyses of interviews with managers and documents from the included establishments. We intended for this time-consuming method to result in definitions that can be used in forthcoming studies. Based on the definition developed in the MOA-study, an interview template was developed in the Healthy Work Place Study (and is presented in a forthcoming report, Härenstam et al, manuscript).

In some organisational aspects (such as centralization), established theoretical constructs seem to be difficult to use in contemporary working life. We experienced difficulties in transferring the traditional meaning of some concepts into the contemporary organisational reality. When defining organisational levels and execution and distribution of power, it may either be a matter of theory or an empirical issue. This issue is now being investigated in a follow-up study. However, we propose that the definitions that our analyses resulted in (described in appendix) can be recommended in future studies.

The chosen methodology for assessment of organisational aspects – structured interviews with managers – worked out well and can likewise be recommended for future studies. Rather than having open questions for qualitative analyses, we propose that a structured interview with fixed and well-defined answer alternatives ought to be used. In most aspects, the assessments of organisational conditions were categorised by three different labels. We found that this rather "rough" categorization is feasible when the sample encompasses a broad range of organisations.

We also conclude that questionnaires do not seem to produce valid information as managers use a broad variety of concepts for similar aspects and the concepts used in research sometimes are not used in organisational practice. We conclude that asking managers and workers to retrospectively assess the rate and nature of change produces valid information that can be used in investigations of changes in organisations and working conditions. It also seems that changes are easier for informants to assess than are "states".

3) How can the linkage between organisations and individuals be analysed?

Three methodological approaches were applied that we can recommend for future studies. The *first* was to perform *cluster analyses* in order to identify groups of organisations that were similar with regard to organisational structures and organisational changes, respectively. We assumed that separate organisations do not

themselves influence working conditions. Instead, we suggested that complex patterns and interactions between several characteristics are associated with working conditions. We conclude that this strategy worked out well and resulted in valid and interpretable clusters of organisations that can be used to explore the link with working conditions at the individual level by a variety of statistical techniques. The main statistical technique applied here was *multilevel analysis*. This methodology has two main advantages. One is the ability to differentiate the total variance in working conditions and work related health that can be attributed to organisational factors and individual factors, respectively. The second advantage of multilevel analysis is that interactions between levels in a hierarchy (such as organisational factors and individual factors) can be explored. This means those specific organisational conditions that may affect how individual characteristics influence working conditions or health. We found that a certain type of change at the work place level has different consequences at the individual level. Thus, results on how organisational structures affect workers cannot be generalised to all groups of workers. This is an important observation that should be taken into account in a theoretical understanding of the linkage between organisations and individuals.

The *third* methodology was *qualitative analyses of interviews*. This approach is a very valuable supplement to quantitative analyses for the understanding of complex relations and processes, particularly if the study object of interest is not well understood.

We conclude that contextual methods, such as pattern analyses and multilevel analysis, were found to be useful techniques and can be recommended in future studies of the significance of organisations for working conditions. Qualitative analyses of interviews with workers and managers as well as case studies are valuable supplements in studies of the linkage between organisations and individuals.

4) What is the impact of conditions at the organisational level on working conditions?

Although organisations are volatile, flexible and sometimes difficult to describe and define, our results provide supporting evidence for organisations being important mediators between societal changes and labour market changes and individuals. Visible patterns of organisational structures and changes emerged that lend support for the changes in the basic principles for organisation of work and the need for established theories to be tested and, perhaps, modified in order to reach a theoretical understanding of the significance of organisation for working conditions and health in contemporary working life. The MOA-study identified several distinct patterns of organisational structures and changes, all with different associations with working conditions. We also showed that the organisational significance for working conditions is considerable. The best working conditions were found in the Individual-oriented organisations and the worst in Public-oriented and female-dominated organisations.

The results of analyses of patterns of organisational structures showed that a large proportion (9-66%) of the variance was attributed to the organisational level. Pattern of organisational structure (named by stake-holder orientation) was significantly associated with many outcomes even when gender composition and individual factors (gender and education) were adjusted for. The highest proportion of variance attributed to the organisational level was found in analyses of ergonomic/physical aspects. But the variance in complexity in job tasks and control was also high (46 and 38%, respectively). Gender composition at the workplace was only important as regards the level of control. Women had lower levels of control than men in all organisations but the female-dominated ones.

The results of organisational changes showed that a relatively large proportion (10-65%) of the variance in working conditions was attributed to organisational level and both pattern of changes and sector were important. Organisations that had not been subject to change showed the best work conditions. The "standardising" and "market-adjusting" patterns had deleterious effects, while the "lean" and the "centralizing" patterns had dual outcomes. Working conditions were more negatively affected in the public sector than in the private.

5) Do associations between organisational characteristics and working conditions differ between different categories of the work force?[17]

We found several indications of how the impact of organisational level conditions differ between groups of the work force, for example, the gender in minority and older workers seem to be particularly vulnerable to organisational change. This is an important observation that should be taken into account in a theoretical understanding of the linkage between organisations and individuals.

Another observation was that the most negative organisational changes were more often implemented in organisations with a large proportion of female staff and many temporary employees. On the other hand, establishments with the best working conditions primarily employed groups with a strong position in the labour market. These observations indicate that organisational change contributes to increased differentiation of working conditions, as different types of changes congregate in specific areas of the labour market and affect groups of employees in different ways. An important question for future studies concerns the contexts in which different organisational change strategies are applied, and how different strategies contribute to or act against polarisation of the labour force and a sustainable working life.

6) Identification of important research questions

In order to understand the mechanisms between organisations and individuals, and as organisations are not isolated entities, we have touched on issues that relate to the link between organisations and their environment even if it was beyond our objective. Several of the issues that in the quantitative and qualitative analyses were shown to be important pertain to this link. This means that intra-organisa-

[17] Such as women and men, groups with different educational levels and age.

tional aspects are not sufficient when trying to explain the organisational impact on working conditions. We identified some issues that seem particularly interesting for theoretical development and further empirical studies: “stakeholder orientation”, “type of operations and work objects”, “organisational changes”, “centralisation and responsibilisation” and “distribution of risks and inequalities in working life”.

Implications for practice and future research

The strength of the present study is that it tries to bridge the gap between work and health research, on the one hand, and organisation research, on the other. We believe that knowledge from both these research fields are needed in order to be successful in intervention, prevention and health promotion. Our results strongly support the contention that organisations matter. At the same time, most intervention programmes are directed at individuals and specific job tasks rather than management technologies or the implementation of organisational changes. In addition to empirical evidence, the report provides guidance on what to assess, how to assess and analyse. Such information is intended to support future research and evaluations of intervention programmes. Hopefully our report can be valuable for many groups interested in promoting healthy working conditions, such as organisational researchers, occupational health researchers, OHS experts and managers.

The MOA-study has pointed to a number of complications in the relationship between the organisation and its individual employees, but has also shown that there are systematic regularities within and between organisations that need theoretical development. Further development of the research questions, formulating and testing hypotheses are undertaken in the on-going Healthy Work Place study. The organisational significance for working conditions and health needs to be explored in future studies. Another issue that our study could not explore on account of the limited number of individuals, was to investigate which organisational level is the most important one for working conditions, both with regards to the question of the main source of the organisational design but also to where we should look for to find the sufficient degrees of freedom to act in order to prevent and solve work environment problems. A third issue that should be explored is the generalisability of results on organisational significance for working conditions in different types of operations.

Finally, recommendations for actions to promote healthy and developing work as well as prevention of job-related ill health should be elaborated in order to apply knowledge from studies linking organisational characteristics with working conditions. One important conclusion of our study is that organisational structures have a direct impact on working conditions. But equally important are staffing structures, policies and the macro-environment of the organisation when trying to understand the organisational impact on work.

Acknowledgements

The MOA-study was performed in 1994-2000 in cooperation between the Departments of Occupational and Environmental Medicine at the County Councils in Stockholm and Örebro with financial support from the Swedish Council for Work Life Research, the Swedish Council of Research, the National Institute of Public Health and the National Instititute for Working Life. The authors of the present report were together responsible for method development, data collection and analyses on organisational structures and changes.

The first author was the project director and has written the main body of the text. Anna Rydbeck was responsible for the part-study on organisational structures and working conditions (Rydbeck et al, 1999). Kerstin Waldenström was responsible for the external assessments of individual working conditions and Per Wiklund for the qualitative analyses of interviews with the study persons. Monica Karlqvist was responsible for the documentation of the analyses and classification of the interviews with managers on organisational aspects. Several other members of the MOA Research Group have contributed to the methods, data collection and analyses of data at the individual level; Lena Karlqvist and Ola Leijon (ergonomic aspects), Gun Nise (occupational hygiene aspects) and Gunnel Ahlberg and Gun Johansson (psychosocial aspects), Lennart Bodin and Patrik Schéele (statistical expertise).

We are greatful to Staffan Marklund and Malin Bolin (within the research group at Arbetslivsinstitutet) and to Magnus Sverke and Torbjörn Stjernberg, reviewers of a first version of the present report, for valuable comments.

Abstract

Härenstam A, Rydbeck A, Karlkvist M, Waldenström K, Wiklund P and the MOA Research Group (2004) *The Significance of Organisation for Healthy Work. Methods, study design, analysing strategies and empirical results from the MOA-study.* Arbete och Hälsa 2004:13, Stockholm: National Institute for Working Life.

The aim is to contribute to knowledge concerning the linkage between organisations and working conditions and health in contemporary working life. The study tries to bridge the gap between work and health research, on the one hand, and organisation research, on the other. We believe that knowledge from both these research fields are needed in order to be successful in intervention, prevention and health promotion. Empirical evidence and experience from data collection in one specific study (the MOA-study) are presented and used as illustrations of methodological issues that need to be dealt with.

Results of pattern and multilevel analyses of organisational characteristics and changes and their importance for working conditions are described. The results strongly support the contention that organisations matter. The results of multilevel analyses showed that a large proportion (9-66%) of the variance in working conditions was attributed to the organisational level. In addition to empirical evidence, the report provides guidance on what to assess, how to assess and analyse. Specific organisational dimensions linked with working conditions are identified and empirically tested. Such information is intended to support future research and evaluations of intervention programmes. Finally, conclusions from the empirical results, experiences from the data collection and analyses are drawn and research questions of interest for future research are raised. Issues that seem particularly interesting for theoretical development and further empirical studies are: “stakeholder orientation”, “type of operations and work objects”, “organisational changes”, “centralisation and responsibilisation” and “distribution of risks and inequalities in working life”. One important conclusion of our study is that organisational structures and changes have a direct impact on working conditions. But equally important are staffing structures, policies and the macro-environment of the organisation when trying to understand the organisational impact on work.

Hopefully our report can be valuable for many groups interested in studying and promoting healthy working conditions, such as organisational researchers, occupational health researchers, OHS experts and managers.

Abstract in Swedish

Härenstam A, Rydbeck A, Karlkvist M, Waldenström K, Wiklund P och the MOA Research Group (2004) *Organisationens betydelse för goda arbetsförhållanden. Metoder, studiedesign, analysstrategier och empiriska reslutat från MOA-projektet.* Arbete och Hälsa 2004:13, Stockholm: Arbetslivsinstitutet.

Syftet är att bidra med kunskap om länken mellan organisation och arbetsförhållanden i dagens arbetsliv. Studien försöker brygga över klyftan mellan arbetshälsoforskningen å ena sidan och organisationsforskningen å den andra. Vår utgångspunkt är att kunskap från båda dessa forskningsområden behövs för att kunna användas vid intervention, förebyggande och hälsobefrämjande insatser i arbetslivet. Empiriska resultat och erfarenheter från en specifik studie (MOA-projektet) presenteras och används för att illustrera metodologiska problem. Resultat från mönsteranalyser och flernivåanalyser presenteras om hur organisatoriska förhållanden och förändringar påverkar arbetsförhållanden. Resultaten visar tydligt att arbetsorganisationen har stor betydelse då en hög andel (9-66%) av variansen i arbetsförhållanden kunde förklaras av förhållanden på organisationsnivån. Förutom empiriska resultat, ger rapporten vägledning om vilka organisatoriska aspekter som bör mätas och hur de kan mätas och analyseras. Specifika organisatoriska dimensioner som har betydelse för arbetsvillkoren identifieras och prövas statistiskt. Sådan information syftar till att vara ett stöd för framtida forskning och utvärderingar av interventionsprogram.

Slutligen dras slutsatser av de empiriska resultaten och av erfarenheterna från datainsamlingen och frågeställningar av intresse för framtida forskning formuleras. Exempel på teman där ytterligare teoretisk utveckling och empiriska studier av organisationer och arbetsvillkor behövs är: ”intressentorientering”, ”typ av verksamhet och arbetsobjekt”, ”organisatoriska förändringar”, ”centralisering och responsibilisering” samt ”fördelning av risker och ojämlikhet i arbetslivet”. En viktig slutsats är att organisatoriska strukturer har ett direkt inflytande på arbetsförhållanden. Men lika viktigt är hur organisationer bemannas, hur personalpolicyn är utformad, och hur marknadssituationen är för att förstå organisationens inverkan på arbetsförhållandena.

Förhoppningen är att rapporten kan användas av många olika grupper som är intresserade av att studera och förbättra arbetsmiljöer, såsom organisationsforskare, arbetshälsoforskare, företagshälsovården och chefer.

References

Ahlberg G, Härenstam A, Wiklund P & the MOA Research Group (1999) "Subjective significances" – Validation of the Demand-Control Model. In Ahlberg G, *Psychological demands and Decision latitude within health care work*. Doctoral dissertation, Stockholm, Department of Psychology, Stockholm University.

Ahrne G & Hedström P (eds.) (1999) *Organisationer och samhäller, analytiska perspektiv*. Lund: Studentlitteratur.

Ainsworth B, Haskell W, Leon A, Jacobs D, Montoye J & Paffenbarger R (1993). Compendium of physical activities: classification of energy costs of human physical activities. *Med Sci Sports Exerc*. 25:71-80.

Allvin M, Wiklund P, Härenstam A & Aronsson G (1999) *Frikopplad eller frånkopplad. Om innebörder och konsekvenser av gränslösa arbeten*. Arbete och hälsa 1999:02. Stockholm, National Institute for Working Life.

Allvin M & Aronsson G (2001) The future of work environment reforms: Does the concept of Work Environment apply within the New Economy. In: Thörnquist A (ed.) *Work Life, Work Environment and Work Safety in Transition: Historical and Sociological perspectives on their Development in Sweden during the 20th century*. Work Life in Transition 2001:9, Stockholm: National Institute for Working Life.

Altman N & Deiβ M (1998) Productivity by Systemic Rationalization: Good Work – Bad Work – No Work? *Economic and Industrial Democracy* 19:1:137-159.

Arbetshälsorapporten (1999) Stockholm: Yrkesmedicin, Stockholms läns landsting.

Aronsson G (1999) Contingent Workers and Health and Safety. *Work, Employment and Society* 13:3:439-459.

Beck U (1992) *Risk Society. Towards a new modernity,* Sage, London, pp.139-149.

Bejerot E, Söderfeldt B, Aronsson G, Härenstam A & Söderfeldt M (1998a) Perceived control systems, work conditions and efficiency among Swedish dentists: interaction between two sides of Human Resource Management. *Acta Odontologica Scandinavica* 57:46-54.

Bejerot E, Söderfeldt B, Aronsson G, Härenstam A & Söderfeldt M (1998b) Changes in control systems assessed by publicly employed dentists in comparison with other professionals. *Acta Odontologica Scandinavica* 56:30-35.

Bejerot E & Söderfeldt B (2000) Enclosure in human services: The Panopticon of Dentistry. Work life and organizational changes and how they are perceived by the employees. In: Isaksson K, Hogstedt C, Eriksson C & Theorell T (eds.) *Health Effects of the New Labour Market*. Pp. 105-117. NewYork: Kluwer Academic/Plenum Publishers.

Bergman L, Magnusson D & El-Khouri B (2003*) Studying individual development in an interindividual context*. New York: Lawrence Erlbaum Associates Inc., Publishers.

Blauner R (1964) *Alienation and Freedom*. Chicago: University of Chicago Press.

Bliese PD & Jex SM (1999) Incorporating multiple levels of analysis into occupational stress research. *Work & Stress* 13:1-6.

Bliese PD & Castro CA (2000) Role Clarity, work overload and organizational support: multilevel evidence of the importance of support. *Work & Stress* 14:65-73.

Bliese PD & Jex SM (2002) Incorporating a Multilevel Perspective Into occupational Stress Research: Theoretical, Methodological, and Practical Implications. *Journal of Occupational Health Psychology* 7:265-276.

Bodin L, Härenstam A, Nise G & Schéele P (1997) *Klusteranalys av yrkesmatris som stöd för urvalsprocessen i MOA-projektet*. MOA-projektet. Yrkes- och miljömedicinska kliniken, Regionsjukhuset i Örebro.

Borg (1970) Perceived exertion as an indicator of somatic stress. *Scandinavian Journal of Rehabilitation Medicine,* 2: 92-98.

Bryk S & Raudenbush S (1992) *Hierarchical Linear Models: Applications and data analysis methods*. Sage Publications.

Burns T & Stalker GM (1961). *The Management of Innovation,* London: Tavistock.

Burstyn I & Teschke K (1999) Studying the determinants of exposure: a review of methods. *American Industrial Hygiene Association Journal* 60:1:57-72.

Castells M (2000) Information technology and Global Capitalism. In: Hutton W & Giddens A (eds.) *On the Edge – Living With Global Capitalism*. London: Jonathan Cape.

Child J & McGrath RG (2001) Organizations unfettered: Organizational form in an information-intensive economy. *Academy of Management Journal* 44:1136-1148.

Cogliser C & Schriesheim C (2000) Exploring work unit context and leader-member exchange: A multi-level perspective. *Journal of Organizational Behavior* 21:487-511.

Creswell JW (2003) *Research Design: Qualitative, Quantitative, and Mixed-Methods Approaches*. Thousand Oaks: Sage publications.

Denzin NK (1978) *The research act: A theoretical introduction to sociological methods* (2nd ed). New York: McGraw-Hill.

Dhondt S, Goudswaard A, Jungeteg G, Huuhtanen P, Kuhn K, Peirens K & Pinella J (2000) *State of the Art on the Changing World of Work*. TNO-report 3020107/R2000227.D1. Hoofddorp, The Netherlands: TNO Work and Employment.

Diez-Roux AV (2002) A glossary for multilevel analysis. *Journal of Epidemiology and Community Health* 56:588-594.

Dore R (1997) Jobs and Employment. Good jobs, bad jobs, no jobs. *Industrial Relations Journal* 28:4:262-268.

Duncan C, Jones K & Moon G (1998) Context, composition and heterogenity: Using multilevel models in health research. *Social Science and Medicine* 46:97-117.

Emery F E & Thorsrud E (1969) *Form and content in industrial democracy*. London: Tavistock.

European Foundation for the Improvement of Living and Working Conditions (2002) *Understanding, anticipating and managing Change. Identifying the Drivers of Change*. Conference to launch the European Monitoring Centre on Change, Brussels October 2001. Dublin, 2002.

Everitt B, Landau S & Leese M (2001) *Cluster analysis*. 4th edn, London: Arnold.

Frick K, Langaa Jensen P, Quinlan M & Wilthagen T (eds.) (2000) *Systematic Occupational Health and Safety Management: Perspectives on an International Development*. Oxford: Elsevier Science Ltd.

Gardell B (1977) Psychological and social problems of industrial workers in affluent societies. *International Journal of Psychology*, 12, 125-134.

Garsten C (2004) Be a 'Gumpy': The political technologies of employability in the temporary staffing business. In: Garsten C & Jacobsson K (eds.) *Learning to be employable: new agendas on work, responsibility, and learning in a globalizing world*. Basingstoke: Macmillan.

Garsten C & Jacobsson K (2004) Conclusion: Discursive Transformation and the Nature of Modern Power. In: Garsten C & Jacobsson K (eds.) *Learning to be employable: new agendas on work, responsibility, and learning in a globalizing world*. Basingstoke: Macmillan.

Giertz E (2000) *Measuring success – Identifying performance indicators*. Malmö: Celemilab International AB.

Giertz E & Larsson S (2000) *Tjänstesamhällets arbetsmarknader. Analyser av verksamhetstyper och kompetenskrav 1970-1997*. Nya jobb & företag, rapport nr 18. Stockholm: NUTEK och RALF.

Gil JI (2001) Reorganizing work and decentralizing production - More flexible or just worse working conditions? Industry Report. TUTB Newsletter 15-16. Pp. 56-62. Brussels: European Trade Union Technical Bureau for Health and Safety.

Goldberg DP (1972) *The detection of psychiatric illness by questionnaire*. Oxford: Oxford University Press.

Grandjean E (1988) *Fitting the Task to the Man. A Textbook of Occupational Ergonomics*. 4th ed. London: Taylor & Francis. Pp. 92-99.

Greenan N & Mairesse J (2003) *How do new organizational practices shape production jobs? Results from a Matched Employer-Employee Survey in French Manufacturing*. Document de Travail, No 28, Centre D'Etudes De L'Empli.

Greiner B & Leitner K (1989) Assessment of Job Stress: The RHIA-instrument. In: Landau K & Rohmert W (eds.) *Recent Developments in Job Analysis.* Philadelphia: Taylor & Francis. Pp. 53-66.

Hacker W (1993) *Objective work environment: Analysis and evaluation of objective work characteristics. A healthier work environment - Basic concepts and methods of measurement.* Regional office for Europe Environment and Health department, Copenhagen.

Hackman JR & Oldham GR (1976) Motivation through the design of work: Test of a theory. *Organizational Behavior and Human Performance* 16:250-279.

Hagberg M, Punnett L, Bergqvist U, Burdof A, Härenstam A, Kristensen T, Lillienberg L, Quinn M, Smith T & Westberg H (2001) Broadening the View of Exposure Assessment. *Scandinavian Journal of Work Environment and Health* 27:5:354-357.

Herzberg F (1966) *Work and Nature of Man*. Cleveland and New York: The World Publ. Co.

Härenstam A & Bejerot B (1995) Styrsystem, effektivitet och arbetsvillkor. [Management , efficiency and work environment]. In: Westlander et al (eds.) *På väg mot det goda arbetet* [On the way toward good working conditions]. Pp. 123-147 Solna: Arbetslivsinstitutet.

Härenstam A, Ahlberg-Hultén G, Bodin L, Jansson C, Johansson G, Johansson K, Karlqvist L, Leijon O, Nise G, Rydbeck A, Schéele P, Westberg H & Wiklund P (1999a) *Vad kännetecknar och innebär moderna arbets- och livsvillkor? Slutrapport I. MOA-projektet*. Rapport från Yrkesmedicinska enheten 1999:8, Stockholm: Stockholms läns landsting.

Härenstam A, Ahlberg-Hultén G, Bodin L, Jansson C, Johansson G, Johansson K, Karlqvist L, Leijon O, Nise G, Rydbeck A, Schéele P, Westberg H & Wiklund P (1999b) *Beskrivning och utvärdering av variabler om arbets- och livsvillkor. Slutrapport II. MOA-projektet.* Rapport från Yrkesmedicinska enheten 1999:9, Stockholm: Stockholms läns landsting.

Härenstam A, Ahlberg-Hultén G, Bodin L, Johansson G, Johansson K, Karlqvist L, Leijon O, Nise G, Rydbeck A, Schéele P & Wiklund P (1999c) *Urvalsstrategier, studiegruppen och forskningsprocessen. Slutrapport III, MOA-projektet*. Rapport från Yrkesmedicinska enheten 1999:12, Stockholm: Stockholms läns landsting.

Härenstam A (1999d) Orsaker till förändrade arbetsförhållanden. Om samband mellan arbetsvillkor och ohälsa i Stockholms län. *Arbetshälsorapporten,* Kapitel 6. Pp. 72-88. Stockholm: Yrkesmedicin, Samhällsmedicin & Stockholms läns landsting.

Härenstam A, Westberg H, Karlqvist l, Leijon O, Rydbeck A, Waldenström K, Wiklund P, Nise G & Jansson C (2000a) *Hur kan könsskillnader i arbets- och livsvillkor förstås?* Arbete och hälsa 2000:15. Pp. 88-116. Solna: Arbetslivsinstitutet.

Härenstam A, Rydbeck A, Johansson K, Karlqvist M & Wiklund P (2000b) Work life and organizational changes and how they are perceived by the employees. In: Isaksson K, Hogstedt C, Eriksson C & Theorell T (eds.) *Health Effects of the New Labour Market*. Pp. 105-117. NewYork: Kluwer Academic/Plenum Publishers.

Härenstam A, Bejerot E, Johansson K, Leijon O & Schéele P (2000c) Mager och god eller mean och lean? Samband mellan organisationsförändringar och arbetsförhållanden. In: Barklöf K (ed.) *Smärtgränsen? En antologi om hälsokonsekvenser i magra organisationer*. Rådet för arbetslivsforskning. Uppsala: Ord och Vetande AB.

Härenstam A & Bejerot E (2001) Combining Professional Work with Family Responsibilities - a Burden or a Blessing? *International Journal of Social Welfare* 10:202-214.

Härenstam A, Bodin L, Karlqvist L, Nise G, Schéele P and the MOA-research group (2003) Patterns of working and living conditions. A person-oriented, multivariate approach for occupational health studies. *Work & Stress,* 17;73-92.

Härenstam A, Bejerot E, Schéele P, Waldenström K, Leijon O, and the MOA Research Group (2004) Multilevel analyses of organizational change and working conditions in public and private sector. *European Journal of Work and Organizational Psychology,* 2004;13(3), 305-343.

Härenstam A & the MOA Research Group (2005). Different trends in working life and increased ill-health demand new work environment strategies. Work. *Work: A Journal of Prevention, Assessment and rehabilitation*, 24(3).

Härenstam A, Marklund S, Berntsson E, Bolin M & Ylander J. Understanding the organisational impact on working conditions and health. Manuscript.

ILO (2001) *Guidelines on occupational safety and health management systems.* ILO-OSH 2001, Geneva: International Labour Office.

Johnson JV & Hall EM (1996) Dialectic Between Conceptual and Causal Inquiry in Psychosocial Work-Environment Research. *Journal of Occupational Health Psychology* 1:362-374.

Jonge J de, Mulder MJGP & Nijhuis FJN (1999) The incorporation of different demand concepts in the Job Demand-Control Model: Effects on health care professionals. *Social Science and Medicine,* 4 8(9), 1149-1160.

Jonge J de, Breukelen GJP, Landeweerd JA & Nijhuis FJN (1999) Comparing Group and Individual Level Assessments of Job Characteristics in Testing the Job Demand-Control Model: A Multilevel Approach. *Human Relations* 52:95-122.

Kalleberg A (1994) Studying Employers and Their Employees: Comparative Approaches. *Acta Sociologica* 37:223-229.

Karasek R (1979) Job demands, job decision latitude and mental strain; implications for job design. *Administrative Science Quarterly* 24:285-306.

Karasek R & Theorell T (1990) *Healthy Work*. New York: Basic Books.

Karlqvist L, Härenstam A, Leijon O, Schéele P & the MOA research group (2003) Excessive physical demands in modern working life and characteristics of working and living conditions of individuals at risk. *Scandinavian Journal of Work Environment and Health*, 29;363-377.

Katz D & Kahn R (1978) *The Social Psychology of Organizations.* New York.

Kauppinen K & Kandolin I (1998) *Gender and working conditions in the European Union.* Dublin, Ireland: The European Foundation for the Improvement of Living and Working Conditions.

Kohn ML & Schooler C (1983) *Work and Personality: An Inquiry Into the Impact of Social Stratification.* Norwood, NJ: Ablex.

Kornhauser A (1965) *The Mental Health of Industrial Workers.* New York: Wiley.

Krantz G & Östergren PO (2002) Do common symptoms in women predict long spells of sickness absence? A prospective community-based study on Swedish woman 40 to 50 years of age. *Scandinavian Journal of Public Health* 30:176-183.

Larsson T (2000) The Diffusion of Employer Responsibility. In: Frick K et al (eds.) *Systematic Occupational Health and Safety Management: Perspectives on an International Development.* Chapter 10. Oxford: Elsevier Science Ltd.

Lazarus RS (1966) *Psychological Stress and the Coping Process.* New York: McGraw-Hill

Leavitt HJ (1965) Applied Organisational Change in Industry: Structural, Technological and Humanistic Approaches, In: JG March (ed) *Handbook of Organizations,* Chicago: Rand McNally.

Le Grand C, Szulkin R & Thålin M (1993) *Sveriges Arbetsplatser – Organisation, personalutveckling, styrning.* [Workplaces in Sweden – Organization, staff development and management]. Stockholm: SNS Förlag.

Legge K (1995) *Human Resource Management. Rhetorics and Realities.* London: Macmillan.

Leijon O, Wiktorin C, Härenstam A, Karlqvist L & the MOA research group (2002) Validity of a self administered questionnaire for assessing physical work loads in a general population. *Journal of Occupational and Environmental Medicine*, 44;724-735.

Levi L, Sauter ST & Shiomitsu T (2000) Work-Related Stress – It´s Time to Act. *Journal of Occupational Health Psychology* 4:394-396.

Littler CR (1982) *The Development of the Labour Process in Capitalist Societies.* London: Heineman.

Lounsbury M & Ventresca M (2003) The new structuralism in organizational theory. *Organization* 10:3:457-480.

Lysgaard S (1961) *Arbeiderkollektivet.* Oslo: Universitetsforlaget.

Marshall N, Barnett R & Sayer A (1997) The Changing Work Force, Job Stress and Psychological Distress. *Journal of Occupational Health Psychology* 2:99-107.

Matthews A, Hertzman C, Ostry A & Power C (1998) Gender, work roles and psychosocial work characteristics as determinants of health. *Social Science Medicine,* 46, 1417–1424.

Messing K, Dumais L, Courville J, Seifert AM & Boucher M (1994) Evaluation of exposure data from women and men with the same job title. *Journal of Occupational Medicine* 36:913-917.

Mitter S (1986) *Common Fate, Common Bond: Women in the Global Economy,* London: Pluta.

NORA (2002) NORA *Organization of Work Team Members, The Changing organization of work and the safety and health of working people. Knowledge gaps and research directions.* Cincinnati NIOSH, Department of Health and Human Services, National Institute for Occupational Safety and Health.

Pfeffer J (1997) *New Directions for Organisational Theory: Problems and Practices,* Oxford: Oxford University Press.

Pollert A (1988) Dismantling flexibility. *Capital and Class,* 34, spring:42-75.

Pugh DS (1973) The Measurement of Organization Structure: Does Context Determine Form?, *Organizational Dynamics,* spring 1973, pp. 19-34.

Pugh DS, Hickson DJ, Hinings CR & Turner C (1969) The Context of Organization Structures. *Administrative Science Quarterly,* 14:91-114.

Purcell K & Purcell J (1998) Insourcing, outsourcing, and the growth of contingent labour as evidence of flexible employment strategies. *European Journal of Work and Organizational Psychology* 7:39-59.

Quinlan M, Mayhew C & and Bohle P (2001) The Global Expansion of Precarious Employment, Work Disorganization, and Consequences for Occupational Health: A Review of Recent Research. *International Journal of Health Service* 31:335-414.

Rose N (1999) *Powers of Freedom.* Cambridge University Press, Cambridge.

Rydbeck A, Härenstam A, Johansson K, Karlqvist M & Wiklund P (1999) Organisational characteristics and their importance in studies of working conditions for women and men. Abstracts, International Research Conference: *Health Hazards and Challenges in the New Working Life,* jan, 1999, Arbetslivsinstitutet, Stockholm.

Sahlin-Andersson K (1996) Imitating by Editing Success: The Construction of Organizational Fields. In: B Czarniawska & G Sevón (eds), *Translating Organizational Change,* Berlin: Walter de Gruyter.

SAS Institute (1996) SAS/STAT Software 6.11. Changes and enhancements through release. Pp. 531-656. Cary, NC.

Scott WR (1998) *Organizations: Rational, Natural, and Open Systems.* Upper Saddle River, NJ: Prentice Hall

Sevón G (1996) Organizational Imitation in Identity Formation, In: B Czarniawska & G Sevón, Berlin: Walter de Gruyter.

Thompson P & McHugh D (2002) *Work Organisations*, 3rd edition, Basingstoke, Hampshire: Palgrave.

Sennet R (1998) *The Corrosion of Character: The personal consequences of work in the new capitalism.* New York: W.W.Norton & Company.

Sjöstrand SE (1999) Om ledarskap i näringslivet. Ingår i *Slutbetänkandet från Arbetslivsdelegationen "Individen i arbetslivet - perspektiv på det samtida arbetslivet kring sekelskiftet år 2000".* SOU 1999:69, Stockholm: Norstedts tryckeri.

Snijders T & Bosker R (1999) *Multilevel Analysis. An introduction to basic and advanced multilevel modeling.* London: Sage Publications Ltd.

Statistics Sweden (2000) *The Work Environment,* SCB/ASS Statistiska meddelanden, AM68SM0001, Stockholm; Arbetsmiljöverket and Statistics Sweden.

Szulkin R (1999) Making People Work: Control and Incentives in Swedish Organizations. *Acta Sociologica* 42:103-122.

Tilly C & Tilly C (1998) *Work under Capitalism.* Oxford: Boulder Press.

Thompson P & McHugh D (2002) *Work Organizations, A Critical Introduction*, 3rd edition, New York: Palgrave.

Trist EL (1978) On Socio-technocal Systems. In: Pampre WA & Sherwood JJ (eds.) *Socio-technical Systems, a sourcebook.* La Jolla: University Associates, Inc.

Vahtera J, Pentti J & Uutela A (1996) The effect of objective job demands in registered sickness absence spells; do personal, social and job-related resources act as moderators? *Work & Stress* 10:4:286-308.

Van Yperen NW & Snijders TAB (2000) A Multilevel Analysis of the Demands-Control Model: Is Stress at Work Determined by Factors at the Group Level or the Individual Level? *Journal of Occupational Health Psychology* 5:1:182-190.

Volpert W (1974) *Handlungsstrukturanalyse.* Köln: Pahl-Rugenstein Verlag.

Volpert W (1982) The model of the hierarchical-sequential organization of action. In: Hacker W, Volpert W & von Cranach M (eds.) *Cognitive and motivational aspects of action: XXIInd International congress of psychology*. Pp. 35-51. Leipzig GDR 1980: selected revised papers, Amsterdam: Oxford: North-Holland.

Waldenström M, Josephson M, Persson C et al (1998) Interview Reliability for assessing Mental Work Demands. *Journal of Occupational Health Psychology* 3:209-216.

Waldenström K, Lundberg L, Waldenström M, Härenstam A & the MOA-research group (2003) Does psychological distress influence reporting of demands and control in work? *Occupational and Environmental Medicine,* 60:887-891

Waldenström K & Härenstam A (manuscript) Externally assessed working conditions for women and men in different groups according to the job demand control model, submitted.

Wiklund P & Härenstam A (1995) *Eremitkräftan utan skal. Om arbetsförhållanden av betydelse vid organisationsförändring. En kvalitativ studie.* Rapport från Yrkesmedicinska enheten 1995:9. Stockholm.

Wiktorin C, Selin K, Ekenvall & Alfredsson L (1996) An interview technique for recording of work postures in epidemiological studies. *International Journal of Epidemiology,* 25, 171–180.

Womack JP, Jones DT & Roos D (1990) *The Machine that Changed the World: The Triumph of Lean Production.* New York: Rawson, Macmillan.

Woodward J (1958) *Management and Technology,* London: HMSO.

Åstrand P-O & Rodahl K (1986) *Textbook of work physiology. Physiological bases of exercise.* 3rd ed. New York: Mc Graw-Hill Book Company.

Appendices

Appendix 1 Descriptive data of variables regarding the workplaces

Organisations solely comprising the self-employed are excluded. N= 72 establishments

Label	Variable	Value labels	n/%	Range	Definition
V1	External power	n	72	1-3	3= Considerable dependence of strategic decisions from owners, board, politicians
		1 None/small	25%		
		2 Some	32%		
		3 Considerable	43%		
V4	Top-level power	n	72	1-3	3=Large influence from managers at the highest level in the organisation
		1 None/small	13%		
		2 Some	36%		
		3 Considerable	51%		
V5	Lower-level power	N	72	1-3	3=Large influence from managers at lower levels in the organisation (non relevant if only managers on one level)
		0 not relevant	31%		
		1 None/small	11%		
		2 Some	21%		
		3 Considerable	38%		
V6	Decision levels	n	72	1-3	3= three or more decision levels in the organisation
		1	44%		
		2	54%		
		≥ 3	1%		
V8	Changed structure of power	n	72	1-3	3= Decisions influencing the daily performance/organisation of work, access of resources etc. have been centralised the last two years
		1 Decentralisation	15%		
		2 Unchanged	78%		
		3 Centralisation	7%		
V10	Part of a large organisation	N	72		
		No	28%		
		Yes, one level	24%		
		Yes, ≥ 2 levels	49%		
V11	Changed ownership	N	72		During the last two years
		No	86%		
		Yes	14%		
V15	Competition	n	72	1-3	3= The work place is exposed to high competition on the market
		1 None/small	19%		
		2 Some	29%		
		3 Considerable	51%		
V19	Customer adjusted production	n	72	1-3	3= The production (of goods and/or services) is to a high degree adjusted to the customers orders/needs
		1 None/small	11%		
		2 Some	44%		
		3 Considerable	44%		
V20	Disposition of work in space	n	72	1-3	1= All production is located to one address
		1 All	43%		
		2 ≥ 50%	25%		
		3 < 50%	32%		
V21	Disposition of work in time	n	72	1-3	
		1 Office hours	43%		1 five days per week
		2 06-22			2 between 5 to 7 days/week
		3 Day and night	28%		3 between 5 to 7 days/week
			29%		

Label	Variable	**Value labels**		**Range**	**Definition**
V22	Technology dependency	n	72	1-3	3= The level of technology in production and the dependency of technology in the production is high
		1 None/small	31%		
		2 Some	29%		
		3 Considerable	40%		
V23	Changes of the production process	n	72	1-3	3= Considerable changes during the last two years of the production process (methods, technology etc)
		1 None/small	63%		
		2 Some	26%		
		3 Considerable	11%		
V24	Information technology	N	72	1-3	3= The use and dependency of IT is high (for communication and/or production)
		1 None/small	40%		
		2 Some	33%		
		3 Considerable	26%		
V25	Customer orientation	N	72	1-3	3= The organisation is considerably customer oriented (long term relations regarding development of products)
		1 None/small	39%		
		2 Some	32%		
		3 Considerable	29%		
V26	Formalisation	n	72	1-3	3= Considerable formalisation of operations and organisational structures
		1 None/small	42%		
		2 Some	40%		
		3 Considerable	18%		
V27	Group-organising	n	72	1-3	3= The work is to a high degree organised as groups: 2-30 persons dependent on each other, sharing the same manager and work objects, formalised by the employer
		0 not relevant	3%		
		1 not at all	53%		
		2 to some extent	31%		
		3 to a large extent	14%		
V28	Changed work organisation	N	72	0-3	3= Considerably changed structures of the work organisation
		0 Not relevant	40%		
		1 Small	19%		
		2 Some	21%		
		3 Considerable	19%		
V30	Vertical integration	n	72	1-3	3= The work process is to a high degree organised as to integrate planning and performance
		1 None/small	35%		
		2 Some	40%		
		3 Considerable	25%		
V31	Change of vertical integration	n	72	1-3	
		1 Decreased	1%		
		2 Unchanged	83%		
		3 Increased	15%		
V32	Horizontal/functional integration	n	72	1-3	3= The work process is to a high degree organised as flows
		1 None/small	36%		
		2 Some	35%		
		3 Considerable	29%		

Label	Variable	**Value labels**		**Range**	**Definition**
V34	Hard control systems	n	72		3= Major use of some kind of result monitoring in quantitative terms that presuppose some kind of standardisation of production
		1 None/Small	40%	1-3	
		2 Some	28%		
		3 Major use	32%		
V35	Changed hard control systems	n	72		
		1 Decreased	0%	1-3	
		2 Unchanged	78%		
		3 Increased	22%		
V36	Soft control systems	n	72		3= Major use of soft control systems such as dialogue with management, development talks, discussions in quality management groups
		1 None/Small	29%	1-3	
		2 Some	46%		
		3 Major use	25%		
V37	Changed soft control systems	n	72	1-3	
		1 Decreased	0%		
		2 Unchanged	86%		
		3 Increased	14%		
V38	Financial incentives in the salary system	n	72	1-3	1= < 20% of the salary for at most 10% of the staff 3= ≥20% of the salary for > 50% of the staff
		1 None/very small	71%		
		2 Some	21%		
		3 Major use	8%		
V39	Wage system	n	72	1-3	
		1 Mainly collective	43%		
		2 Mixture ind./coll.	1%		
		3 Mainly individual	56%		
V42	Social work contacts in production	n	72	1-3	3= The performance of work is to high degree dependent of social interaction between employees
		1 None/small	44%		
		2 Some	42%		
		3 Considerable	14%		
V43	Social work contacts outside the work place	n	72	1-3	3= The performance is to a high degree dependent on social interaction with e.g. customers, contractors or distributors outside the work place
		1 None/small	61%		
		2 Some	29%		
		3 Considerable	10%		
V48	Staff size (number of employees)	n	72	1-3	
		1 Small (<10)	14%		
		2 Medium (10-149)	67%		
		3 Large (>150)	19%		
V49	Changed staff size	n	72	1-3	
		1 Increased	14%		
		2 Unchanged	58%		
		3 Decreased	28%		
V51	Changed proportion of women	n	72		
		1 Decreased	7%	1-3	
		2 Unchanged	89%		
		3 Increased	4%		

Label	Variable	**Value labels**		**Range**	**Definition**
V52	Gender segregation in the workplace	N 1 None 2 Some 3 Considerable	72 21% 38% 41%	1-3	3 = Considerable gender segregation, both vertically and horizontally (women and men do not do the same things, and occupy different positions).
V54	Age distribution	N 1 mainly <35 years 2 mixed 3 mainly > 45	72 21% 55% 24%	1-3	
V55	Proportion of blue collar workers	N 1 high: > 70% 2 medium 30-70% 3 low > 30%	72 68% 10% 22%	1-3	
V56	Proportion of graduated employees	N 1 None 2 < 50% 3 > 50%	72 51% 33% 15%	1-3	
V57	Competence mixture	N 1 < average 2 ≈ average 3 > average	72 64% 7% 29%		Average means national average of educational level among employees
V58	Changed qualification requirements	n 1 Decreased 2 Unchanged 3 Increased	72 44% 45% 11%	1-3	
V60	Staff turnover	N Small/none <15% /year >15% /year	72 6% 78% 17%	1-3	
V61	Internal mobility	N 1 None 2 Some 3 Considerable	72 38% 57% 6%	1-3	3 = Good opportunities for most employees to change jobs and/or positions within the organisation.
V62	In-house training	N 1 None 2 Some 3 Considerable	72 17% 63% 21%	1-3	2= Most employees have had some in-house training or some have had many days and others almost none 3= Most of the employees have had in-house training for at least a week every year
V63	Full time employees	N 1 All 2 ≥ 90% 3 < 90%	72 19% 50% 31%	1-3	
V64	Proportion of temporary employees	n 1 Low <10% 2 Medium (10-30%) 3 High (>30%)	72 51% 29% 19%	1-3	

Label	Variable	**Value labels**		**Range**	**Definition**
V65	Changed proportion of temporary employees	N 1 Decreased 2 Unchanged 3 Increased	72 3% 93% 4%	1-3	
V66	Ethnicity Proportion of employees with foreign background	N 1 < 10% 2 11-40% 3 > 40%	72 78% 18% 4%	1-3	
V67	Changed proportion of employees with foreign background	N 1 Decreased 2 Unchanged 3 Increased	72 0% 95% 5%	1-3	
V69	Occupational health service	N 1 yes 2 no	72 75% 25%	1-3	
V76	Job enrichment	N 1 None 2 Some 3 Considerable	72 58% 36% 6%	1-3	3= Number of job tasks and responsibilities have increased considerably for many of the employees during the last 2 years
V77	Chain organisation	0-1	26%		
V78	Subcontractor	0-1	29%		
V79	Type of production (Giertz)	High tech Welfare Service Labour-intensive industrial prod	15% 25% 54% 6%		

Appendix 2. Descriptions of indexes regarding workplace characteristics

Structures, abbr Str; Change strategies, abbr Cha; Management technologies, abbr. Man; Production process, abbr Pro, Contextual factors abbr Con. *= included in the formation of clusters on organisational characteristics, #= included in the formation of clusters on organisational change strategies. Organisations comprising only self-employed are excluded. N=72. W= index identically included in the Wolff study *W= included but not identically*

Type Incl in cluster	**Label & included variables**	**Index name**	**M** **SD** **Md**	**Min-max Range, C.a**	**Direction**
Str * #	**X1** v1+v4 v5+v6	Structure of power	7.79 2.12 8.00	3-11 8 0.43	The higher, the more centralised the power structure (no.of decision levels, degree of influence of management and owners)
Str **W**	**X23** v1+v4+ v5+ v8	Centralising power structure	8.14 1.96 9	4-12 8 0.37	The higher, the more centralised and increased centralised power structure
Str W	**X12** v6 + v10+ v26	Bureaucracy	5.54 1.58 6	3-8 5 0.57	The higher, the more decision levels, the greater formalisation plus part of a larger organisation
Man * **W**	**X9** v38+ v39	Economic incentives	3.50 1.05 4.0	2-6 4 -0.53	The higher, the greater the proportions of individually negotiated and performance-related pay.
Man **W**	**X20** v36+37	Soft technologies	4.1 0.87 4.0	3-6 3 0.25	The higher, the more extensive and increased use of management technologies such as dialogue and development talks
Man **W**	**X21** v34+35	Hard technologies	4.14 1.07 4.0	3-6 3 0.41	The higher, the more extensive and increased use of quantitative result and productivity monitoring
Man **W**	**X15** v38 + 39+ 43	Individualisation	4.99 1.42 5.0	3-8 5 0.58	The higher, the more individualised reward systems, and the more is the production based on external social interaction
Man **W**	**X13** v60+64+ 49b+63+ 65	Numeral flexibility	6.22 1.21 6	4 –9 5 0.50	The higher, the more changes of staff size, the higher and increased use of temporary employment and the more part-time contracts
Man ***W***	**X14** v61+62 +76	Functional flexibility	5.19 1.25 5	3-8 5 0.45	The higher, the more internal mobility, in-house training, and more job tasks
Cha **W**	**X17** v8 + v35	Centralising power and control	72 4.14 0.66	3-6 3 0.17	The higher, the more centralised power and increased use of hard control systems
Cha # ***W***	X6 v31+ 33	Change in integration	4.26 0.71 4.00	2-6 4 0.75	The higher, the greater increase in integration (vertical and horizontal).
Cha # ***W***	**X3** v23+28	Changes to organisation & prod. process	2.68 1.61 2.0	2-6 4 0.57	The higher, the more changes to work organisation and production process.
Cha # ***W***	**X19** v23+58+ 31+33	Flow organising	7.42 1.48 7.0	5-12 7 0.57	The higher, the more changes of production systems, increased demands of competence & integration of work process
Cha # W	**X10** v8+11+3 1+33+35 +37+49+ 58+65+2 3+28	No. of changes	3.90 3.0 3.00	0-12 12	The higher, the greater the number of changes (despite direction, i.e., no change or any type of change) + extent of changed production process and work organisation.

Type	**Label and included variables**	Index name	**M SD Md**	**Min-max Range C.a**	**Direction**
Pro * # **W**	**X16b** v24+v25 +v57+v58	Innovativeness	72 7.08 2.15 7.0	4-12 8 0.58	The higher, the more IT dependent production, long-term customer relations regarding development of production, the greater the educational level and the more increased demands of competence
Pro W	**X16** V55+v56+v 57 +v24 + v25	Innovative capacity	72 8.60 3.07 8.0	5-15 10 0.80	The higher, the more IT dependent production, the more long-term customer relations regarding development of production, the greater the educational level, the less blue collar and the more white collar worker
Pro * **W**	**X5** v30+ v32	Degree of integration	3.83 1.36 4.0	2-6 4 0.65	The higher, the greater the vertical and functional integration of the work process.
Pro * **W**	**X7** v27+ v42+ v43	Prod.-based on social interaction	4.74 1.61 4.0	2-9 7 0.61	High: production is to a high degree based on teamwork, and social relations inside and outside the workplace.
Pro * **W**	**X24** v27+v42	Internal social interaction	3.25 1.3 3.0	1-6 5 0.71	High; the production is to a high degree based on team working & social interactions among colleagues at the work place
Con * **W**	**X25** v25+v43	External social interaction	3.39 1.28 3.0	2-6 4 0.63	High; the production is to a high degree based on external social interaction with network, contractors, distributors or customers
Con * **W**	**X4** v22+ v24	Technical/IT-based production	3.96 1.5 4.0	2-6 4 0.78	High; the production is to a high degree based on high technology and IT.
Con # **W**	**X18** v57+58	Competence-based production	3.32 1.33 3.0	2-6 4 0.56	High; the production is to a high degree based on high and increased demands of formal education and competence
Con **W**	**X2** v55+56+57	Competence structure	4.83 2.33 3.0	3-9 6 0.93	High; large proportion of graduated employees and low proportion of low educated compared to national average
Con * **W**	**X8** v20+21	Disposition of work in time and place	3.75 1.24 4.0	2-6 4	High; large amount of atypical disposition of work (i.e. departure from working office hours at just one address)
Con * # **W**	**X11** v15+19	State of competition	4.65 1.24 5.0	2-6 4 0.60	High; large amount of market-adjusted production and tough competition on the market.

Appendix 3. Descriptive data of dimensions of self-reported and externally assessed working conditions at the individual level

Self-employed are excluded, n=208. Means, sd or %

		Variables	Distribution			
Type	Nr		Internal drop-out	Mean (%)	s d	range
Self-reported working conditions	Ix 1	Demands	14	13.2	3.0	6-20
	Ix 2	Control	8	17.5	3.3	10-24
	Ix 3	Decision authority	5	5.8	1.8	2-8
	Ix 4	Skill discretion	6	11.7	2.0	7-16
	Ix 5	Obstacles	21	17.5	3.9	10-27
	Ix 6	Customer contacts	4	4.5	2.0	2-8
	Ix 7	Social support (high=bad)	20	5.3	1.7	3-10
	Ix 8	Physical exertion	25	12.3	3.1	6-18
	Ix 9	Ergonomic conditions (high=bad)	5	8.6	2.8	6-19
	Ix 10	Quality of general work env. (high=bad)	6	6.2	2.2	0-10
	Ix 11	Chemical/physical factors	5	25.6	7.1	18-56
	V 1	Balance between spheres, low	36	1.9	0.8	1-3
	Ix12	Psychosocial climate	14	30.8	5.3	14-41
	Ix13	Supportive organisation	14	17.6	3.5	7-26
	V17	Pay per month full time work % low	0	26%		1-3
Self-reported changes of working conditions	Ix 14	Extrinsic rewards	17	6.3	1.1	3-9
	Ix15	Influence and development	17	8.9	1.7	5-12
	Ix16	Worry and conflict	20	5.3	1.6	3-9
	Ix17	Career & development possibilities	18	3.7	1.5	2-6
	V2	Work load, increased	17	56%		1-3
	V3	Influence, increased	18	28%		1-3
	V4	Pay in relation to effort, reduced	18	22%		1-3
	V5	Collaboration, teamwork, incr.	18	23%		1-3
	V6	Job security, increased	18	33%		1-3
Externally assessed working conditions	Ix18	Ergonomic strain	18	25.4	22.9	00-88
	V7	Routine work % of work	0	34.2	27.1	0-100
	V8	Creativity % of work	0	6.5	7.5	0-39
	V9	Time-bound work % of work	0	24.7	36.4	0-100
	V10	Time-pressure % of work	0	28.3	40.0	0-100
	V11	Social interaction % of work	18	46.0	39.9	0-100
	Ix19	Circulatory load (%HRR)	4	20.1	7.6	6-43
	Ix20	Physical/chemical exposures	0	8.0	2.5	6-17
	V12	Mental overload	0	14%		0-1
	V13	Under stimulation	0	16%		0-1
	V14	Physical overload	29	25%		0-1
	V15	Noise (Db)	0	77.4	5.2	67-91
	V16	Sitting position % of work		51.6	31.7	0-100

Appendix 4 A-C. Correlations (Spearman) between indexes on organisational changes and work conditions

	(n=208)	Structure			Management technologies					
		Hierarchy and centr. power X1	Central -ised power X23	Burea-cracy X12	Economic incentives X9	Soft techno-logies X20	Hard techno-logies X21	Individ-ualisation X15	Numeral flexibility X13	Functional flexibility X14
Self-reported changes of working	Extrinsic rewards	-.156*		-.179*					-.151*	
	Influence and development					.168*				
	Worry and conflict		.184**	.213**						.204**
	Career possibilities					.189**				
Self-reported working conditions	Demands			.160*	.165*			.234**		
	Control	-212**	-.224**		.320***	.263***	-.146*	.314***	-.281***	
	Decision authority	-.198**	-.223**		.251***	.183**	-.208**	.190**	-.296***	
	Skill discretion	-.167*	-.173*		.305***	.276***		.342***	-.222**	
	Obstacles	.189**	.186*	.248**			.181*	.189**		
	Lack of social support	.152*								
	Customer contacts			.163*	.223**		-.164*	.315***	.176*	
	Physical exertion				-.211**	-.161*		-.258***		-.204**
	Ergonomic conditions				-.200**			-.290***		-.166*
	Low quality of general work environ				-.405***	-.188**		-.429***		
Externally assessed working conditions	Routine work			-.142*	-.443***	-.215**		-.525***	.191**	-.244***
	Creativity				.430***	.204**		.534***	-.146*	.247**
	Time-bound work				-.203**			-.184**	.140*	
	Time-pressure			.154*		-.171*				
	Social interaction				.249**			.266**	-.215**	.171*
	Circulatory load				-.147*		-.169*	-.156*		
	Ergonomic strain		.149*		-.301***	-.160*		-.395***	.189**	
	Sitting position				.151*			.240***		
	Noise				-.233**		-.153*	-.317***		-.168*
	Chemical /physical exp.				-.417***			-.440***		

* p<.05, ** p<.01, ***p<.001

Appendix 4 B Correlations (Spearman) between indexes on organisational characteristics and work conditions (n=208).

Type of individual variable	Type of organi-sational variable	Changes					Production process		
		Centralising of power and control X17	Change in integration X6	Changes to organisation & prod. process X3	Flow organising X19	No of changes X10	Innova-tiveness X16b	Integration of work process X5	Internal social interaction X24
Self-reported changes of working conditions	Extrinsic rewards			-.209**		-.199**			
	Influence and development	-.260***	.212**		.214**			.146*	
	Worry and conflict		.199**	.321***	.264**	.323***			.191**
	Career possibilities	-199**	.192**		.218**				
Self-reported working conditions	Demands							.167*	.198**
	Control				.171*		.290***	.398***	
	Decision authority						.152*	.364***	
	Skill discretion				.153*		.347***	.344***	
	Obstacles			.224**	.196**	.189**	.220**	.146*	.154*
	Social support (lack of)								
	Customer contacts		-.191**	-.139*		-.200**	.158*	.193**	
	Physical exertion						-.320***		
	Ergonomic conditions	-.144*					-.369***		
	Low quality of general work environment	-.236**					-.429***	-.195**	
Externally assessed working conditions	Routine work				-.137*		-.501***	-.338***	-.271***
	Creativity				.145*		.539***	.434***	.225**
	Time-bound work	-.168*							
	Time-pressure	.185**							
	Social interaction						.199**		.201**
	Circulatory load						-.179**		
	Ergonomic strain						-.456***	-.319***	
	Sitting position						.227**		-.247***
	Noise	-.227**					-.346***		
	Chem/physical exposures	-.314***	.171*				-.266***		

* p<.05, ** p<.01, ***p<.001

Appendix 4 C. Correlations (Spearman) between indexes on organisational characteristics and work conditions (n=208).

		Prod process	Contextual factors					
		Prod. based on social interaction X7	External social interaction X25	Technical/IT dependency X4	Competence - based production X18	Atypical disposition X8	Competence structure X2	Competition on the market X11
Self-reported changes of working conditions	Extrinsic rewards							
	Influence and development			.232**			-.176*	
	Worry and conflict	.193**			.184*			-.173*
	Career possibilities							
Self-reported working conditions	Demands	.248***	.268***					
	Control	.141*	.200**		.308***	-.206**	.363***	
	Decision authority			-.198**	.192**	-.210**	.246***	
	Skill discretion	.182**	.265***		.332***	-.164*	.377***	
	Obstacles	.203**	.161*		.245***		.244***	-.185*
	Lack of social support							
	Customer contacts	.185**	.331***	-.140*	.191**	.216**	.231***	
	Physical exertion		-.199**	-.235***	-.346***		-.330***	
	Ergonomic conditions		-.268***	-.163**	-.370***		-.359***	.170*
	Low quality of general work environ	-.188**	-.283***		-.427***		-.394***	.260***
	Work - family balance							.246***
Externally assessed working conditions	Routine work	-.324***	-.422***		-.532***		-.514***	.302***
	Creativity	.375***	.466***		.543***		.544***	-.258***
	Time-bound work						-.238***	
	Time-pressure		.206**		.189**	.137*	.169*	
	Complex social interaction	.210**			.304***	-.156*	.300***	
	Circulatory load				-.238***		-.197**	
	Ergonomic strain	-.195**	-.396***	-.156*	-.351***		-.408***	.324***
	Sitting position		.263***	.186**	.315***		.295***	
	Noise		-.303***		-.383***		-.364***	
	Chem/physical exposures		-.256**		-.480***	.182**	-.427***	

* p<.05, ** p<.01, ***p<.001